DOCUMENT RESUME

ED 149 722 IR 005 493

AUTHOR Giordano, Mario J.
TITLE The Non-Lock-Step Educational System. Project Summary.
INSTITUTION Camden County Coll., N.J.
SPONS AGENCY Fund for the Improvement of Postsecondary Education (DHEW), Washington, D.C.
PUB DATE 30 Jun 75
CONTRACT OEG-0-74-9275
NOTE 207p.; For related document, see IR 005 494

EDRS PRICE MF-$0.83 HC-$11.37 Plus Postage.
DESCRIPTORS *College Curriculum; *Curriculum Development; Educational Alternatives; Educational Assessment; Evaluation; Higher Education; *Individualized Instruction; *Instructional Design; Instructional Media; Mastery Learning; Performance Based Education; *Post Secondary Education; Programed Instruction

ABSTRACT

The purpose of this effort was to investigate individualized and self-paced instruction systems throughout the country and to develop a detailed document showing how to plan, implement, and operate a self-paced individualized instruction system as an option to a conventional system on the college level. Benefits of such a system are that it can be applied to meet the needs of a wide range of student abilities and, at the same time, it represents an increase in teaching effectiveness and a decrease in cost. First a survey of individualized instruction systems was undertaken, and then the operators of a few systems were invited to aid in the formulation of this prototype system as consultants. Early sections deal with how this learning process is managed and the complete organization of an individualized learning center. Sub-systems within the total system (admissions, registration, bursar) are discussed along with budgetary considerations. Evaluation recommendations include efficiency (cost), effectiveness (achieving instructional goals) and testing the validity of instructional packages. Finally, there are recommendations for planning, implementation, and operation of an individualized, self-paced system. (VT)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED149722

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

THE NON-LOCK-STEP EDUCATIONAL SYSTEM

Submitted by Professor Mario J. Giordano
Project Director

Camden County College
P.O. Box 200, Blackwood, New Jersey
June 30, 1975

PROJECT SUMMARY

OEG-0-74-9275

The Project Reported Herein Was Supported By a Grant From The U.S. Department of Health, Education, and Welfare Fund for the Improvement of Post-Secondary Education

IR005-493

TABLE OF CONTENTS

		Page
	INTRODUCTION	1
	Chapter One	
	MANAGING THE LEARNING PROCESS	
	INTRODUCTION	9
A.	REPORTING FOR INSTRUCTION	11
B.	STUDENT ORIENTATION	13
C.	CYCLES OF LEARNING	15
	1. Issuance of Learning Modules	16
	2. Module Activities and Content	17
	3. Mastery Testing and Its Consequences	19
D.	FORMS	21
E.	PLOTTING AND REPORTING STUDENT PROGRESS	23
F.	STUDENT-FACULTY CONTACTS	24
G.	STUDENT-TEACHER LOAD	27
H.	A PROFESSOR'S CHANGING ROLE	29
I.	RECOMMENDATIONS	31
	1. Issuing Course Modules	32
	2. Tailor-Making the Course To Meet Individual Differences	33
	3. Individualized Learning -- How It Should Work	35

		Page
4.	The Unit of Instruction	37
5.	The Use of Text Materials	38
6.	Programmed Materials	38
7.	Audio-Visual Materials	39
8.	The Module Progress Check	39
9.	The Unit Mastery Test	40
10.	A Proctor-Managed Learning Environment	42
11.	Tracking Student Progress	44
12.	Grading System	46
13.	Recording the Grade	49
14.	On-Going Procedures	51
15.	Graduation	52
16.	Student-Faculty Contacts	52
17.	Student-Teacher Load	53
18.	Stipend Considerations	55
19.	Course Mentor -- The Teacher's New Role	55

Chapter Two

INDIVIDUALIZED-LEARNING CENTER

	INTRODUCTION	58
A.	IS A MULTI-DISCIPLINED CENTER NEEDED?	60
B.	MEDIA FLOW IN AND OUT	61
C.	STUDY CARRELS	63
D.	CONTROLLING MODULE CHECK-OUTS	65
E.	CENTER PERSONNEL	67
F.	RECOMMENDATIONS	68
1.	Course Development Group	69
a.	Development-Group Personnel	71
b.	The Elements of Course Development	72
c.	Off-The-Shelf Course Adaptations	74
d.	Adjunctive Programming	77
e.	The Course Development Process	78
2.	The Course-Production Group	82
3.	Course-Utilization Group	82
a.	Study-Area Design	83

Page

a. Study-Area Design

(1) The Study Area 84
(2) The Monitoring Area 84
(3) The Counseling Area 85
(4) Seminar Areas 85

b. Study-Area Personnel 85

Chapter Three

ADMISSIONS

A. APPLYING FOR ADMISSIONS 87
B. ADMISSIONS REQUIREMENTS 88
C. FORMS AND PROCEDURES 89
D. OUTPUT OF THE ADMISSIONS SUB-SYSTEM 90
E. RECOMMENDATIONS 91

Chapter Four

REGISTRATION

INTRODUCTION 93
A. PRE-REGISTRATION COUNSELING 95
B. PERMIT TO REGISTER. 96
C. FORMS AND PROCEDURES. 97
D. PROOF OF REGISTRATION 98
E. OPEN REGISTRATION 99

Page

F. STUDENT COURSE LOADS 101

G. RECOMMENDATIONS 101

Chapter Five

BURSAR

INTRODUCTION. 104

A. AUTHORIZATION TO PAY. 105

B. FORMS 106

C. TUITION CHARGES 106

D. PROOF OF PAYMENT 107

E. RECOMMENDATIONS 107

Chapter Six

BUDGETARY CONSIDERATIONS

INTRODUCTION. 110

A. COST OF ESTABLISHING A MULTI-MEDIA PRODUCTION LABORATORY 111

B. THE COST OF PRODUCING A SET OF LEARNING MODULES FOR ONE COURSE 113

C., PRODUCTION TIME COMPARISONS 115

D. COST-EFFECTIVENESS RATIO. 117

E. MULTI-MEDIA PRODUCTION-LAB COSTS. 120

F. RECOMMENDATIONS 124

Page

Chapter Seven

EVALUATION OF INDIVIDUALIZED INSTRUCTION

INTRODUCTION 125

A. RECOMMENDATIONS 129

1. Testing for Efficiency (Cost) 130

a. Cost Variables 130

(1) *Instruction Costs* 131
(2) *Module Production Costs* 131
(3) *Para-Professional Costs* 132
(4) *Equipment Costs* 133
(5) *Miscellaneous Costs* 135

2. Testing for Effectiveness (Achieving Instructional Goals) 137

a. Objective Data 138
b. Subjective Data 139

3. Testing the Validity of Instructional Packages 141

a. Developmental Testing 141
b. Field Testing 142
c. Follow-Up 142

Chapter Eight

PLANNING AND IMPLEMENTATION

INTRODUCTION 144

A. THE PLANNING YEAR 145

B. THE IMPLEMENTATION YEAR 152

Page

C. RECOMMENDATIONS 155

1. The Planning Year 155

a. Start-Up Activities:

(1) Advisory Committee 158
(2) Planning Meetings 158
(3) Hiring New Personnel 161
(4) The Educational Technology Workshop . . 161
(5) Purchase Orders 163

b. Multi-Discipline Learning-Center Preparation 165

c. Module Production 166

(1) Integrated Hierarchy 167
(2) Course Planning 172
(3) Production of Materials 174
(4) Validation of Learning Packages 175

d. Student Admissions 177

e. Student Registration 178

2. The Implementation Year 179

3. The Operation Year 181

Chapter Nine

CONCLUSIONS

NARRATIVE 182

BIBLIOGRAPHY 191

List Of Figures

Figure		Page
1	Organizing the C.I.L.	70
2	Chart of Course Development Procedures. .	73
3	Planning, Implementation, and Operations Schedule	157
4	A Typical Course Production Schedule . .	173

9

APPENDIX

	Page
Report on Consultant DR. ROBERT TOFT	197
Report on Consultant DR. KIM PORTER	219
Report on Consultant DR. LEE HARRISBERGER	237
Report on Consultant DR. DONALD TOSTI.	261
Report on Consultant PROF. RICHARD HEYDINGER	283
Report on Consultant DR. JAMES HAMMONS	297
Report on Consultant DR. J. GILMOUR SHERMAN	321
Report on Consultant DR. JOHN GALLAGHER.	355
Report on Consultant DR. ROBERT HURST.	379

INTRODUCTION

This document is an end-of-the-project report submitted to the Department of Health, Education, and Welfare -- more specifically, to the Fund for the Improvement of Post-Secondary Education. Authorization for this project was issued under Grant Number OEG-0-74-9275.

The purpose of this effort was to investigate individualized and self-paced instruction systems throughout the country and develop a document that shows in detail how to plan, implement, and operate a self-paced individualized-instruction system as an option to a currently operating conventional system on the college level. The resultant document is to be made available to H.E.W. for their use in implementing similar programs in other colleges throughout the country as well as in Camden County College of New Jersey.

The primary plan of action followed was, first, to determine how many individualized-instruction systems are extant in the United States and, then, to invite the operators of a few systems to Camden County College as consultants to aid in the formation of a complete individualized instruction system that can be used to guide others.

Additionally, a search was made of key books, pamphlets, and articles currently in print on the subject of individualized instruction. This data revealed the identity of other leading pedagogs, some of whom became consultants to this project.

The documentations that were scanned for data are listed in the Bibliography. This information was not collected for direct quotation but rather to get a picture of the current state of the art.

Those who participated as consultants -- in the order in which they participated -- were:

Dr. Robert Toft
Dean of College IV, Grand Valley State Colleges, Allendale, Michigan

Dr. Kim Porter
Director of Life-Lab, Miami-Dade Community College, Florida

Dr. Lee Harrisberger
Dean of Science and Engineering, University of Texas at the Permian Basin, Odessa, Texas

Dr. Donald Tosti
Executive Vice-President, Independent Learning Institute, Corte Madera, California

Prof. Richard Heydinger
Partner, Formative Evaluation Research Associates (FERA), Ann Arbor, Michigan

Dr. James O. Hammons
Former Dean of the College, Burlington County College, Burlington, New Jersey. Presently, a member of the Center For the Study of Higher Education, Pennsylvania State University, Pennsylvania

Dr. J. Gilmour Sherman
Director of the Center for Personalized Instruction, Georgetown University, Washington, D.C.

Dr. John Gallagher
Vice-President of Academic Affairs, Brookdale Community College, Brookdale, New Jersey

Dr. Robert Hurst
Associate Professor of Biology, Purdue University, Illinois

Professor Mario J. Giordano, Director of the project, compiled the data, synthesized the information into a total system, and coordinated the project's activities.

The routines by which the information was gathered had to be performed, part-time, around the full-time duties of the Director, which did not allow for too much traveling. Consultants, therefore, were asked to answer, on tape, a list of questions. On the average, the "taped" interview generally took approximately two mornings to complete.

During the afternoons, oral discussions were held between the Director and the consultants. The interview was culminated on the visitor's last day by a fact-finding meeting with the executive administrators of the College.

After the consultant left, the data from the tapes and meetings were typed into report form and mailed to the consultant for content correction. A final copy of each report is included in the appendix.

Each report was later segmented into separate answers to individual questions and filed by answer number. In this way, all the answers to a particular question were viewed in consensus form, in similarities, and in differences of opinions. These views, along with the Director's recommendations on each sub-system, comprise this final document.

A document dealing with the total system embracing individualized instruction would not be complete without the full delineation of how individualized instruction operates. Chapter One describes how this learning process is managed. It shows how a student reports for instruction, receives his orientation, and enters the cycle of learning in individualized instruction. Subjects such as issuing learning modules, what they contain, and mastery testing are also described. Much detail is given to how a student's progress is plotted through his faculty contacts. Space is also given to the student-teacher load and a professor's changing role. The chapter is completed by a detailed recommendation on how this learning process should be operated.

Chapter Two deals with the complete organization of an individualized learning center. Such topics as equipment and center operations are addressed in detail. Additionally, the routines for developing course modules, producing them, and utilizing them are fully explained.

This effort dealt not only with individualized instruction as a method of imparting knowledge, but also with the total system required to facilitate such a method. Each sub-system (e.g., Admissions, Registration, Bursar, etc.) were handled separately and form the contents of Chapters Three, Four, and Five.

Chapter Six deals with the cost of operating a system based on individualized instruction. This chapter was, by far, the most difficult to compile since very few agreements concerning cost and methods for determining them existed among the consultants.

Since it was expected that the users of this document would be newly installing individualized instruction systems, it was felt necessary to design a method by which the system -- along with its personnel and its components -- could be evaluated. The resultant evaluation recommendations -- covering both cost-effectiveness and module validation -- comprises Chapter Seven.

Chapter Eight deals with the activities of planning and implementing an individualized instruction system on a college level.

To better understand and use the contents of this document, it is necessary to discuss briefly the various premises and definitions on which its contents are based.

First, we feel that the conventional educational system -- sometimes known as the lock-step system -- has certain inherent failings -- mainly, that its pace is too fast for the slow students and not challenging to the faster ones. Because of these failings, the lock-step system weakens the basic objective of an effective educational system -- that it is to be responsive to individual differences in students and to their different needs as well.

It is not within the scope of this document to discuss what these student-needs are, or how much education is enough. We are merely addressing the problem of installing a second, optional educational system that will be responsive to those students who have difficulty with the conventional mode.

We also feel that, to be responsive to individual differences, the system must have the capability of having its instructional sequences tailored to the individual needs of each student. This means that the instructional sequences should be frequently modified to accomodate the findings of an on-going assessment of student progress; that is, instruction must change for each individual student, based on the findings of frequently given achievement tests. This viewpoint also serves as our definition of individualized instruction.

We also hold that, before "individualizing" instruction, one must first express educational objectives in a more precise manner than is currently the case; that is, that educational objectives should be stated in specific behavioral terms that are measurable. Moreover, the student should be apprised of these objectives and what the student must do, in a test, to prove that learning has taken place.

Along with being more specific about behavioral objectives, we hold that a student should not be allowed to proceed into more advanced work without first having achieved mastery of preceding activities. Therefore, the principles of "learning-for-mastery" as outlined by Dr. Benjamin Bloom should be the basis for measuring achievement.

We also hold that self-paced learning systems are not necessarily "individualized " Their learning packages when found to be too linear in design, should be adapted to meet the tenants of individualized instruction.

Additionally, we feel that an educational system should be self-enrolling as well as self-paced. By "self-enrolling" we mean that students should be allowed to start a course at any time during the year. By "self-pacing" we mean that each student should be allowed to complete the course at his own pace, without time restraints.

Finally, the system should contain open scheduling, whereby students can report to study centers at self-determined times rather than to a classroom at college-determined times. This means that a student's class schedule will be determined by the student, who will report for instruction or for assessment at times convenient to him.

The foregoing concepts, definitions, and viewpoints are not intended to be dogmas but rather to inform the reader of our viewpoints in designing the individualized instruction system contained in this document.

It is further recommended that this report be used not as the last word in system-construction or in individualized instruction but rather as a guide to install individualized instruction systems in colleges already using the conventional mode of instruction.

The opinions expressed in this document do, however, represent the thinking of some national leaders in individualized instruction, some of whom served as consultants in this project. Their collective agreements represent the data needed to make a fairly decent start in this system.

Chapter One

MANAGING THE LEARNING PROCESS

In trying to make an exact distinction between those instructional programs that are individualized and those that are not, one comes to a rude awakening: every program -- more or less -- is individualized to some extent. Individualized instruction takes place somewhat in every classroom. When an instructor stops addressing himself to the group and zeroes in on individuals, individualization takes place. Whenever an instructor changes his lesson plans in response to a student query, individualization somewhat takes place. The more frequent instruction is modified and changed to suit the needs of individual students, the greater the scope of individualization that takes place. The way in which these changes are made is far less important than the frequency with which individual student needs are reflected in the decision to change instruction.

In a program that individualizes learning for each student, however, the sequence of learning changes frequently and thus imposes a new responsibility on the instructor -- that of managing instruction.

Dr. Tosti defined instructional management as those activities involved in the decision to initiate a special activity for a given student, based upon an assessment of that student's performance. So,

instructional management occurs when the instructor, noting that a student is having difficulty in learning a particular skill, decides to prescribe special homework or to provide one-to-one tutoring.

To put it another way, instructional management takes place when an instructor assesses the performance of a student and, from the results of this assessment, selects a special presentation to which the student is exposed. Individualization takes place, therefore, in terms of the frequency and quality of the decision to change instructional presentation as a result of assessing student performance.

There are six types of instructional management that are explained in detail by Dr. Tosti in his "Learning Is Getting Easier." They are:

1. ASPIRATIONAL MANAGEMENT: determines the extent to which each student's goals will influence the learning steps he or she will pursue.

2. ACHIEVEMENT MANAGEMENT: controls the frequency and use of the feedback given to students for remediation.

3. PRESCRIPTIVE MANAGEMENT: provides students with well-informed decisions as to the most efficient learning activity for him as an individual.

4. MOTIVATION MANAGEMENT: influences the intensity of the student's personal involvement in the learning process.

5. ENRICHMENT MANAGEMENT: broadens the student's ability to identify the student's applications in their own personal experience of concepts learned.

6. MAINTENANCE MANAGEMENT: influences the extent to which the student will be able to recall important information or continue to maintain a skill after the initial learning experience.

It is not within the scope of this report to explain the intricies of instructional management. This has been done well enough by others. This document, rather, addresses itself to the broad system functions that regulate the learning process -- which is not so thoroughly documented -- within which instruction is managed. It deals, instead, with how students report for instruction; how they are oriented to the new system; how they go through the cycles of learning indicative of self-paced instruction; the forms that are used to manage instruction; how students progress is plotted and reported; and how the teacher's role changes when involved in a self-paced individualized learning environment.

A. *REPORTING FOR INSTRUCTION*

One main weakness of many systems is the manner in which the student reports for instruction. Most consultants reported that, in their experiences with other systems, a student is seldom asked to prove that he belongs in the class to which he is reporting.

Dr. Toft reports that this is presently true at College IV. He states that, "... A student may come to a faculty member and ask for tutoring on a given module. The faculty member takes for granted that the student has paid for that module, and tutoring takes place..."

This weakness is being corrected. Next year, faculty will have a computer print-out produced on a regular basis that will contain a list of all students and their tuition balances. Addi-

tionally, faculty will be able to consult the computer through their terminals and receive an up to date transcript for each student. This transcript will show all the modules selected, the date of selection, all attempts at mastery, and the date of the attempts.

At the Life Lab, the only proof that students have that they belong is their possession of logs (as in Captain's log) in which they record their learning experiences. This is given to them at registration time; and since the Life Lab handles its own registration, only students bearing logs are officially enrolled in the course.

Dr. Tosti reports that, in his experience, he has observed that students generally report to class with the usual class card and enrollment forms. Most of the other consultants, however, stated that they provide class lists in the form of a computer print-out that names the students that are in each course.

Ideally, self-paced systems will evolve into a system where each student will eventually possess a card, similar to a credit card, which may be magnitized and entered into a small computer, and which would take care of checking for things like dollar balances, module selection, and so on. The computer will produce for each faculty member a list of those students taking each module in his discipline and the record of progress for each.

B. *STUDENT ORIENTATION*

Orientation to a self-paced, individualized-instruction course is a most critical matter because students encounter great differences from the conventional system of instruction. Moreover, these differences need to be done accurately, thoroughly, and standardly.

Dr. Hammons found, through trial and error at Burlington, that he could not leave the matter of student orientation up to each individual instructor because each had his or her own opinions regarding what was supposed to be happening. They each communicated their own affective feelings and attitudes toward the system; and in many instances, they were not altogether in harmony with the direction and goals of the institution.

At College IV, before a student gets to his mentor, he views a film about individualized instruction. The mentor then talks to the student about his or her academic needs and gives advice on certain modules to be taken.

At the Life Lab, the student joins an orientation group directed by a coordinator and a programmer. Students remain in this group from four to six weeks.

Dr. Tosti recommends several approaches that he uses. One is to hand out a sheet indicating how the course will be operated. Then the students are tested on the contents of the course structure as a first module. Mastery of the course logic is thus assured.

It also gives the students an opportunity to experience success early in the program.

At Georgetown University, on the first day of each semester, students enrolled in a PSI course show up as they would for a normal lecture course. In fact, the first part of the initial class meeting is a normal lecture, essentially, on how the course will proceed. Dr. Sherman lectures at length about how his PSI course is different from most of the other courses at the University. He later explains the procedures and policies of his particular format and then shows a movie about PSI. At the end of the first initial class meeting, students are quizzed on the data they receive that day. They complete the answers to the questions and take the quiz back to a proctor for scoring. If they pass the initial quiz, they are allowed to proceed to unit one.

At Brookdale, orientation is of great significance and most important to their individualized-learning system. There are several stages of orientation for new students. First, before the term begins, all students come on campus to plan their learning programs with the aid of a student-development specialist. Secondly, immediately before each term, all new students come on campus for an orientation in each of the institutions that make up the college. At that time, programs are described, counseling programs are explained, and all elements of the total program are reviewed.

Thirdly, the first entire week of each term is, in a sense, an orientation to individualized learning. During this time, each faculty member reviews the process of individualized learning.

This part of the orientation takes place not merely as a narrative of what Brookdale is like but as an involvement in the first week of the ocurse and the drawing out from that of how the teaching-learning process takes place.

Fourthly, student-development specialists conduct group sessions for new students every week or two during the first term.

These four stages make up a rather elaborate, standardized orientation program at Brookdale.

All the consultants agreed that orientation of new students into this specialized form of learning should not be done on a hit or miss basis but should be the most minutely designed action at the school.

C. *CYCLES OF LEARNING*

The normal cycle of learning in a self-paced individualized instruction system is generally arranged under four major actions that make up the learning cycle:

1. The issuance of learning modules;
2. The learning activities in the modules;
3. Post or mastery testing; and
4. Remediation or issuance of next sequential module.

This following narration individually delineates each of these segments of the learning cycle.

1. *Issuance of Learning Modules*

At College IV, all learning modules are for sale in the bookstore and may be purchased by anyone; whereas, the University of Texas of the Permian Basin uses a variety of segments for the issuance of learning modules. Some of its faculty issue all of the modules to the students at the outset of enrollment. Others prefer to issue the modules to the students a unit at a time. Still another group of faculty prefer to issue their modules through the bookstore where the students pay for them in the same manner that they would pay for a text.

Dr. Harrisberger states on this subject:

> *"... We feel that the learning modules that have been written by the faculty should be paid for by the students in order to recoup at least our clerical costs..."*

For this reason, all modules -- whether issued in the classroom or through the bookstore -- are paid for by the students who use them.

In this, most of the other consultants concur. It matters very little what system is used to issue modules, but it did seem to matter that the student pay for the modules they receive.

2. *Module Activities and Content*

Most consultants stated that modules should be self-contained in that each should indicate what materials are necessary for its completion and where those materials may be found. However, it did matter greatly where students start in the hierarchy of modules.

Dr. Harrisberger stated that one of the most important attributes of the individualized, learning-management system and the development of competency-based learning is that one can institute a pretest or an entry-competency program. Through this device, a student is given an opportunity upon enrollment to write off all or part of the modules in a course and to certify that he, indeed, does have adequate background or advanced skills.

At the University of Texas at the Permian Basin, there are a series of 15 or 20 competency majors that a student can attempt. If he fails to achieve entry level, he is given remedial-instruction units that he must pass through before he is allowed to proceed to those units that require course entry-level skills.

Dr. Harrisberger stated,

> *"... All entering freshmen should be inventoried for their mental skills, and remedial, self-paced modules be made available to improve these skills before they enter the degree program ..."*

At Burlington, each module or learning packet contains a list of activities that are necessary for the accomplishment or achievement of each objective and any special instruction regarding the procurement of resources necessary or where the student must go. Additionally, each learning module contains a formative examination -- that is, a self-test or test that reflects the objectives of the unit. The student takes this test not for grading purposes but rather to indicate to the student the extent to which he has mastered the objectives of the course.

At Georgetown University, each unit study-guide has a procedure section that describes what the student should do to master the material prior to take a mastery test.

In most cases, the consultants named the same activities that should be contained in each module. In fact, the make-up of the entire learning program, in general, should state the course outcomes, and what it is that the student will be able to do when he completes the course. It then breaks down the course into a number of units which may contain three to ten or more modules.

Each unit has, by itself, a unit outcome, a variety of strategies or procedures available to achieve the unit outcomes, and a set of evaluation criteria whereby it is determined whether the student has achieved the unit objectives.

Basically, the overall program consists of a system design, outcomes, procedures, and evaluation criteria. Each are separate from the other so that outcomes are defined in terms of competency, skills, or the kinds of things that one is to do.

3. *Mastery Testing and Its Consequences*

At Life Lab, there is no testing. In place of testing are six "updates" required each term. These are meetings between a student and a programmer who get together to go over the student's Life Lab study contract and log. Dr. Porter explained:

> *"... In this way, testing occurs when the programmer sits down with a student and talks about the student's learning experiences, how they were experienced, and why they were learned. In this way, the programmer determines the quality of learning that has taken place and the next sequential steps that are to be performed by the student ..."*

Most of the other consultants, however, did recommend the learning-for-mastery concept and to require that students master the contents of a module before they are allowed to continue on to the next sequence. Mastery tests are generally graded immediately in the presence of the student and, failing mastery, the student is given a prognosis. When the module is mastered, the student is then advised which modules should be attempted next.

Dr. Tosti stated that he uses three parallel forms of each mastery test in a multiple-choice format. A student who fails to achieve mastery is given a prescription; and when completed, is tested on a parallel form of the mastery test.

Dr. Tosti further recommends that it is much better if testing is done in a central location that can be controlled at all times -- some kind of learning center where the instructor can be stationed somewhat permanently. He further recommends that these central locations should be proctor-managed when feasible.

Dr. Sherman reported:

> *"... When the student has completed the study guide and finds that he can meet the objectives, he will come in and ask the course manager for a test and sit down and take it. As soon as he is finished, he will go to see his proctor. The proctor will look it over and may tell him that he has a perfect score and that he is prepared to go on to the next unit. If he has errors on his test, a few general instructions are given by the proctor -- not answers to questions, mind you, but instructions as to how the student can most effectively find the answers for himself. So, the student goes back to study the specific area where he was found to have problems. Later he comes back and takes the second form of the test. Once he has passed his mastery test and completes a module -- whether it is the first, second, or third time or only after talking with me -- then he is ready to proceed to the next module in the sequence ..."*

Dr. Sherman's views were generally similar to those of the other consultants. They strongly recommend mastery testing, parallel course materials, parallel tests, varying levels of difficulty, prescriptive management, and strict adherance to sequential learning.

D. FORMS

In individualized instruction, more so than in conventional instruction, records must be more quickly and more accurately kept because of frequent testing and progress checking that takes place. Additionally, the flow and monitoring of mastery tests in and out of files must be recorded because of the increased opportunities for cheating that can take place.

Dr. Toft recommends that each faculty member prepare several forms of the mastery exam for each module. A record should also be kept -- such as is done at Georgetown University and Purdue -- where modules are used by students and then returned.

At Georgetown, a student will come in and sign out a particular module that he is ready to study. He writes his answers on a special sheet which is left with the proctor when it is corrected. He returns the test itself, which has been checked out by number. Only after he has returned the module, the test, and the test answer sheet is he released from his responsibility for that unit.

Dr. Sherman stated that, at the end of each day, they check to see that they have all copies of all forms of all units. Since they started doing it this way, they have lost very few documents.

At Purdue, they use a fairly sophisticated computer program that can handle as many different options to a test as the computer is programmed to juggle questions. They also use the computer to keep track of the progress of the students through the course.

In addition to the normal forms used to monitor the flow of classified paper in and out, Dr. Toft has a module-evaulation form attached to each module taken at College IV. This form is their main data collecting device to supply information for the evaluation of modules by students. They are required to hand in the module evaluation form before they are allowed to take the mastery test. A module-evaluation form is found on the last two pages of each module.

Dr. Tosti says that it is a good idea to let the student keep track of his own progress by the use of a progress plotter that provides the student with a records of tests he has taken. He said:

> *"... We found progress plotters to be the lowest costing, the simplest, and probably the single most effective thing one can do in maintaining student progress motivation ..."*

At Burlington, the computer program was written so that it utilized the test from not only the viewpoint of which students failed or which questions were missed most often, but also included a detailed report for each student. Each Monday morning, the faculty members receive a computerized print-out showing student test results and an item analysis of each question.

Dr. Gallagher recommends that the design of forms should evolve from needs that arise in the day-to-day operation of the course and not be pre-designed to meet expected outcomes. Additionally, he said that forms should be designed around the infor-

mation that they are to provide. In other words, the sub-system that is using the information as input data should have a say in the design of the form that will provide this information.

E. PLOTTING AND REPORTING STUDENT PROGRESS

At College IV, the primary document for reporting all student progress is the "Contact Work Sheet." A copy of this is kept by the instructor, one copy is given to the student, one copy is retained by the College IV office, and a college copy is circulated first to the computer center and then to the registrar's office.

At periodic intervals, the computer generates reports on all students. These reports are sent to the registrar's office, to the faculty member, and to the business office.

Dr. Tosti reported that at Cleveland State College, overall student progress is in the form of a computer print-out generated each week for the instructors.

At Burlington, a chart is used that shows the objectives of the course on one axis and the names of each student on another. As the student completes each course objective, his progress is marked on this form for all to see.

At Purdue, Dr. Hurst stated:

> "... *We receive print-outs about every two or three weeks that inform teacher assistants and me of the progress of each student. We also have a terminal that we program to change student records. Teacher assistants can go to the terminal at anytime and request,*

by code number, a student's program or a student's progress report and see what the student has done up to that point in time ..."

In an individualized instruction system, progress of students may be plotted manually, mechanically, or electronically. The selection of the system used to process data is generally determined by the amount of data to be processed, a direct reflection of how many students are enrolled. Where a teacher is handling one class of, say 30 students, he could plot the progress manually and keep his records in a locked file. In a system where one teacher is responsible for 100 to 150 students, more sophisticated methods for processing data on students' progress should be adopted. Utilization of a computer, which is programmed to provide frequent print-outs, is almost a necessity in large self-paced programs.

F. *STUDENT-FACULTY CONTACTS*

College IV has defined a full-time teaching load as maintaining 20 office hours a week for contact with students and generating approximately 320 student credits per term. Dr. Toft reports that some faculty, especially in mathematics, spend an average of 20 minutes per student encounter. In the Social Sciences, that figure rises to 45 minutes per encounter.

Dr. Porter states that at Life Lab, they may spend two hours with each student during their "updates," which can be weekly, by-monthly, or monthly. Some programmers see their students at least weekly and some just every two weeks.

Dr. Tosti reported that he surveyed over 300 instructors who had used his individualized course packages. One of the questions he asked was in regard to how much time they spend in their individualized classrooms as compared to their conventional ones. The majority said it took no more time to operate an individualized class than it did a conventional class. A large number, however, said it did take more time. A relatively small number said it took less time.

Dr. Hammons reported,

> *"... The number of weekly hours spent with students at Burlington was subject to considerable variation. For example, we knew of some people who, each semester, had contact with some 400 students. The average number of hours, though, was never documented; but most faculty members did exceed the number of hours they were required to be in contact with students ..."*

Dr. Hurst stated, that, in the first two or three weeks of the semester, he spends 30 to 40 contact hours with students each week; but, that drops down to eight or ten later on. It averages somewhere between 12 and 16 hours a week, only two or three of which is formally scheduled times.

Self-pacing and individualized instruction require a great deal of one-to-one contact; so much so, that instructors are hard pressed to meet these tutorial requirements. One of the devices used to alieviate the pressure on the professor is that of employing instructional assistants who actually work in the study centers or laboratories. These persons -- known as proctors or para-

professionals or teacher assistants -- are employed up to 40 hours a week. They are primarily responsible to be in the instructional environment, to be up-to-date on the subject matter being taught, and to provide assistance to individual students as they need it. Additionally, they perform the record-keeping duties and material dissemination as well.

Individualized instruction, by definition, requires frequent assessment and change in instructional direction. These requirements make one-to-one a necessity. If a master teacher can be available to the students one-to-one, fine. But, when this is impossible because of a large number of student enrollments, para-professionals, either paid proctors or peer proctors, should be employed to fulfill this one-to-one requirement.

Consequently, the instructor may end up spending comparatively little time with students. Nevertheless, a student does receive a great deal more attention from either an instructional assistant or, in some cases, a tutor.

Dr. Tosti stated that a study was made to determine what effect a proctor-managed system has on the learning process. Its findings show that students actually learn more and better in this type of pedagogy. So, little concern should be shown for the reduction in the instructor-student contacts. Research shows that effective learning <u>is</u> taking place.

G. STUDENT-TEACHER LOAD

One of the main factors used to determine the cost-effectiveness of an educational system is the student/teacher ratio. In spite of its importance, however, determining student/teacher ratios seemed to be the one routine most badly done. The consultants reported a wide variation in methods for determining this factor, which is probably the reason why they found it so difficult to answer questions put to them about their cost-effectiveness ratio.

Dr. Porter reports that the maximum load for any programmer at the Life Lab is 36 FTEs, which is actually 32 to 45 students. The minimum load can be one student or a part of an FTE. No one has a full-time job, however, unless he has 15 or more students.

Dr. Harrisberger found that his faculty are averaging 40 enrollments each, or approximately 120 credit hours of instruction.

Dr. Tosti recommends that the maximum load should be 25 to 30 students.

Dr. Keller of Georgetown University said,

> *"... With proctors, the maximum should be between 100 and 150 students; but there are very successful systems being operated with numbers of 400 to 500 or even 1000..."*

The normal student-teacher ratio at Burlington ranged between 20 to 1 and 22 to 1.

Dr. Sherman said:

"... Since my PSI courses are typically between 100 and 150 students each semester, I just never have any trouble with a 200 load requirement ..."

Dr. Hurst at Purdue reports:

"... We schedule about 50 students to each Teacher Assistant; so, we have a single staff member for most of our large courses. And, if we are talking about a course of 500 students, we will have a single staff member and about ten graduate students. I have about 15 graduate students working for me. Both are full-time graduate instructors, but one works just with the computer..."

One of the best systems for determing student-teacher loads is the one at College IV. There, they use the college-wide student-teacher ratio as the base figure for determining a teacher's load. For instance, since a 20.6-to-one student-teacher ratio is needed to be cost-effective (college-wide), each teacher is responsible for the equivalent of 20 full-time students. Therefore, each teacher must generate approximately 320 credit hours (15.5 credits times 20 students) per semester as his full-time load.

This method seems to be what the other consultants were trying to explain, also; but because of the lack of standardized nomenclature, their recommendations seemed to be different from each other.

For instance, at Life Lab, each programmer is responsible for the total student, not just for one course. When you view the student-teacher load from this viewpoint, Dr. Porter is then saying the same thing said by Dr. Toft.

Therefore, it seems that generating credit-hours-per-term is a common way to express teacher load and, at the same time, a fair way of establishing a standard not only for teacher load but also for overload pay, adjunct pay, and determining cost-effectiveness.

H. A PROFESSOR'S CHANGING ROLE

When asked how the role of a professor employed in a self-paced, individualized system differs from one employed in the conventional system, Dr. Toft stated:

> *"... A primary difference for faculty in a time-free system is that all of the curricula must be on-line all of the time. Thus, the mathematics professor must be ready and able to answer questions from minute to minute ranging from basic arithmetic to post calculus. This puts an enormous demand on the resources of individual faculty members to keep up with the whole of his or her discipline..."*

Dr. Porter answered this question by saying:

> *"... Well, I think the basic answer to that is that we are not professors any more. We are not teachers. We carry the role of 'enabler.' I consider myself a professional enabler, a program-advisor. I am one who enables people to learn..."*

Dr. Harrisberger answered somewhat the same way when he said:

> *"... The professor is now in the role of a learning manager, and he takes individual responsibility for each student's progress..."*

Dr. Tosti stated:

> *"... The most obvious change is that the professor goes from an individual who is the major*

source of information presentation or display to one who is involved with instructional management, evaluation of student performance, and decision-making as to what is next most appropriate for each student..."

Prof. Heydinger, in researching the system at College IV, stated:

"... Basically, we have found that producing curriculum materials and spending a lot of time in one-to-one contact with students is an extremely demanding environment and represents the most important deviation from the normal role of the conventional teacher..."

He goes on to mention that the one-to-one relationship between a professor and his student in a self-paced, individualized-learning environment is another major difference in the teacher's changing role.

Whereas in the conventional system the faculty member's role is primarily that of a disseminator of information, in the self-paced system, the faculty member's role becomes that of a manager of a learning environment in which his responsibilities are to determine objectives for courses; determine learning resources and activities which will assist the student in meeting these objectives; develop a varied means of evaluating achievement and objectives; provide assistance to the students whenever necessary in meeting these objectives; provide motivation to the student to work through the various instructional activities prescribed to make sure that the system is operating; and make sure that the materials are ready at the appropriate place and at the appropriate time.

In an individualized environment, the role of a faculty member tends to change from that of a group-oriented instructor to that of a student-oriented instructor; that is, he spends most of his time working with one student or with small groups of students, whereas in the past he worked essentially with large groups of students of 20 or more.

I. RECOMMENDATIONS

The natural output of a bursar's sub-system is the admit-to-class permit. This should be presented by the students to the mentor upon reporting.

The mentor, having been satisfied through the Admit-To-Class Permit that the student belongs, orients the student to the procedures of the course. However, to avoid the disadvantages of each instructor imparting his own opinion regarding self-paced instruction and communicating these affective feelings and attitudes towards the system, the actual course-orientation should be documented in the same form of learning module that will format the entire course. The mentor should merely go through the document with the student to ascertain the student's complete understanding of what is expected. The student should then be sent off to complete his orientation modules.

In this way, the students will learn all the facts they need to know about the course content and, at the same time, didactically learn how to proceed through a learning module.

New students should be issued, in addition to the course-orientation module, a second module entitled, "How To Be A Student In A Self-Paced Mode of Instruction." This module should cover such topics as study habits, how to study, how to pace yourself, the importance of knowing nomenclature, and many other bits of information that will assist the student in making a smooth transition to the peculiarities of individualized instruction and to managing his own time in a self-paced system.

1. *Issuing Course Modules*

A variety of ways for issuing learning modules should be adopted. Some faculty members will want students to have all the modules and units at the outset. Other mentors will prefer the modules be issued at a unit at a time, the student being allowed to receive the next unit only after mastering the preceding one. There should not, however, be a set pattern. It should depend upon the management style of the mentor and the objectives of the course.

To manage the financial aspects of purchasing modules, however, mentors should be encouraged to use the bookstore and its facilities. The students should buy the modules in the same manner used to purchase textbooks.

Learning modules written by the faculty should be paid for by the students to defray and recoup the clerical and production costs.

2. *Tailor-Making The Course To Meet Individual Differences*

One of the major components of individualized-learning is the use of pretests as the method by which a student's entry-level to a course is ascertained.

Each student should be given a pretest that parallels the post-course test and which validly tests the achievement of each course objective. The pretest, however, should test which course objectives the entering student has already reached. The mentor should then subtract each achieved objective from the objectives of the course and program the student to "walk through" only those learning modules comprising the objectives that he has yet to achieve. Each course is thus somewhat tailored to meet individual differences by allowing the student to by-pass certain parts of the instructional material because of prior performance capabilities.

If time and budget allow, each course should contain modules varying in levels-of-difficulty and mediated in several different ways.

The design of all initial courses in a discipline -- English Composition I, College Math I, and others -- should also include learning modules that develop skills that lead to the required entry-level skills for the course. If a student fails to achieve entry-level, he is then "plugged into" the proper remedial modules for which he has entry-level abilities and proceeds up the hierarchal ladder from there. There-

fore, the remediation factor should be built right into the course itself (see illustration below) and thus mitigate the stigma of having to enroll in a strictly "remedial" course.

In addition to remedial modules, enrichment modules may also be available to the students. These should be designed to handle information and objectives beyond the requirements of the course itself and will be taken by students who desire further study in the discipline.

In short, each student should be required to take an entry-level exam, not as a device to "select out" but rather to determine the proper module from which he will start the course. Some will start with a remediation module, and others may start on a module that represents a partial completion of the course. In this way, each student will determine his own competency, get credit for that which he has already mastered, and proceed on from where he is.

Remediation Modules	*Course Modules*	*Enrichment Modules*
R1 R2 R3 R4 R5	C1 C2 C3 C4 C5	E1 E2 E3 E4 E5

COURSE DESIGN FORMAT

This particular aspect of learning management is extremely relevant to community colleges because of their open-door policy and the resultant wide variations of background skills among

entering students. It is, therefore, advisable that students be pretested as to their competency levels and that they be provided some sort of remediation program as well as post-course enrichment materials for those who desire them.

3. *Individualized Learning -- How It Should Work*

Individualized learning is designed to be student-oriented; therefore, the students themselves should take on the main responsibility in the learning process. When they need help, however, mentors or proctors should be on hand; but the student does the work. To achieve this, learning modules should be carefully designed to give students as much independence as possible.

The learning materials themselves should tell the student, before he starts, what he is expected to accomplish. Also built into the materials should be devices to keep the student aware as to how he is progressing. With this information, the student can independently decide when he is ready to take the mastery test. The entire sequence of events goes something like this:

..... The student receives an entire unit of instruction (from his mentor or his proctor) that contains the objectives for that unit, the sequence of instruction, and the progress checks.

..... The student is allowed to work through the instruction on his own until he, himself, is satisfied that he knows what he should know. At intermittent spots through the unit, the student gives himself the progress checks to insure that he is learning.

..... By comparing his answers with the answers given, the decision to proceed or to review is determined by the student himself. If he is successful on the progress checks, he will know that he is ready for the unit test and will probably do well.

..... When the student is ready, he asks to be given a unit test; afterwhich, the proctor marks the test with the student beside him and gives him immediate feedback on how well he did and where he went wrong, if he did.

..... The student proceeds to a new unit or is asked to review the current unit, based on the proctor's evaluation of the student's unit-test results.

In short, the student works at his own pace and not the pace of other students in the course. He has as many opportunities as he wants to review his work with his mentor or proctor. He determines for himself when learning has taken place.

As the student progresses through the course, he will come to realize that he has acquired a rare skill. He will

have didactically developed a greater ability to manage his own time. Because of this, he will be able to take on greater responsibility in deciding what should be studied, when it should be studied, and to what depth.

This means that the student becomes a much more independent learner, which should mean more to him in the long run than the materials he is learning.

Also, by learning in this manner, it has been shown that students retain more of what they learn because they take a more active role in the learning process.

4. *The Unit of Instruction*

Individualized courses, generally speaking, should be divided into segments of learning, called units. Each unit should lead to educational objectives that require the student to demonstrate mastery of a particular learning task.

To insure that the student is qualified to undertake each new unit, he should be asked to demonstrate that he has thoroughly learned each preceding unit.

The sequence of materials within a unit should differ somewhat from course to course, depending on the subject matter area; but the basic format should be the same.

The unit should be divided into smaller parts, usually referred to as modules. These are the building blocks of the unit, and the number of modules per unit should differ from course to course.

5. *The Use of Text Materials*

The format of a module is determined by what is intended to be taught. Often, reading a chapter in a text will be part of a module assignment. The material should, nevertheless, be carefully presented in a logical and easy to learn gradient or sequence.

At times, the student may be required to perform some exercises after reading the text. These may take on any form, from writing sentences to solving problems. When required, they should insure the student's active participation in the learning process, proved by research findings to increase both the learning rate and the retention of data. Text material in an individualized instruction system, therefore, is just one of many learning sources that should be used.

6. *Programmed Materials*

Often, the materials are best presented in programmed-instruction format. When this is the case, modules should include detailed instructions and, after each group of 50 frames,

self-check panels. These were the additions to programmed instruction that were found in a study conducted by Dr. Tosti to greatly increase the effectiveness of this type of pedagogy.

7. *Audio-Visual Materials*

If the designer of the learning packages requires a more sophisticated method of presenting the learning materials, he should be free to include audio and visual presentations in the modules. Cassette tapes, transparencies, film strips, and movies are some of the media that are used widely. However, when more expensive hardware is considered, the designer should be prepared to justify, through cost-effective rationale, why his choice is necessary.

8. *The Module Progress Check*

The instructional sequence of each module should be followed by a decision-making device called the "Progress Check." The student takes and grades this test himself.

The purpose of the progress check is to let the student know if he has learned the materials presented in the module. If he has, he goes right on to the next module. If he hasn't, the module's progress check should be so designed to automatically disclose a remedial prescription based on incorrectly answered questions. This can be accomplished by having each

of the questions "keyed" to a section or page number of the module it covers. If the student fails to answer the question correctly, a notation alongside the answer should show where the module covers the material of the question. By returning to that section for remediation, the student closes the loop-of-understanding for the objectives of that module.

In some modules, special remediation material should be included. When this is so, a second and different progress check should also be included. This second decision-making device, although different from the first, should cover the same material and be no more difficult to do than the original progress check. It should cover the same material in a different way or in more depth.

After the student is satisfied that he has reached the learning objectives of the module, he may move on to the next module. If not, he should re-study the material or ask the proctor or the mentor for additional help. In any event, complete mastery of each module is necessary to insure mastery of the unit as a whole. The progress checks let the student know where he stands.

9. *The Unit Mastery Test*

Some of the units in individualized courses, as mentioned previously, should contain pretests. However, completing them should be optional to the student.

Unlike the module-progress checks, however, the unit post-test must be passed before the student is allowed to go on to the next unit. The results of this test should be checked by the proctor or the mentor to determine the student's achievement level.

If the student fails to achieve a mastery competency, the proctor or the mentor should, through a diagnostic-prognostic action, prescribe a re-study program. The student should be told where to concentrate his re-study efforts. When the student is once again ready for testing, he should be given a different version of the test. However, the second version should cover the same material tested in the first version.

When the student reaches a mastery-level of competency, this fact should be recorded in the proctor's record book and the student allowed to go on to the next unit. The tests that the student did not pass should be ignored; they should not count against him. He should be allowed to continue the learning-testing cycle as many times as he wishes until he masters the material.

This learning process should remain generally the same throughout the course: presentation of material, decision point, and on to the next module or unit. The only difference is in who is involved in the decision to go on.

The student makes the decision to go on to the next module, but the proctor or mentor makes the decision on the unit level.

10. A Proctor-Managed Learning Environment

Although the mentors may grade tests, carry on discussions with students, and make unit-level decisions, he may also assign these tasks -- provided there are enough students in the course -- to an aide, who might be a student in the class or a paid proctor. When this occurs, the learning environment becomes proctor-managed.

An advantage to having a proctor on duty is that a proctor will make the course easier and more convenient for both the mentor and the students. The students get help more quickly, and they get the results of their unit post-test almost immediately.

Also, by using proctors, the mentor makes available others who have already learned the materials, who can explain areas of uncertainty to students, and who can perform many of the routines that take up so much of a professor's time. The professor can then concentrate his efforts on those duties that require a training in pedagogy and advanced training in the discipline; i.e., module design, module production, module testing and revising, one-to-one tutoring, and the like. The mentor, of course, should also remain responsible for the quality of decisions made about each student. His presence in the study area, therefore, should be frequent if he is to maintain contact with all his students.

Some mentors may decide to select their proctors from the students currently enrolled in the course. When this occurs, he should adopt a system, or one similar to it, like that used at Georgetown University. Dr. Sherman selects his proctors from the first students who achieve mastery on a unit. These students remain proctors so long as they are not "bumped" by other students who achieve mastery on the next or succeeding units at a quicker pace. In this manner, a competition for proctorship is developed and becomes the device that insures that only the best students achieve proctorship roles.

When proctors are paid employees of the college, they should be available to the students at least 30 hours a week. Graduate students -- or at least students who have demonstrated terminal excellence in the discipline -- may be employed to assume this role.

Whatever proctor-managed method is used, proctors generally give all the students more opportunities for rewarding and informative interactions. A proctor-managed system frees the mentor for more responsible tasks than the routine classroom actions that require less-than-professional expertise. He is then available in the study area for special tutoring, monitoring proctor activities, trouble-shooting module deficiencies, designing prescriptive modules and the like.

This is not to say, however, that the proctor has absolute authority over students. Whenever there is a disagreement that cannot be resolved on the proctor level, the matter should be handled by the mentor.

Proctors should always be responsible to mentors. The mentors alone should determine the extent of authority the proctors will assume. The mentor should also retain the authority in defining the grading criteria applied by the proctors and for gathering the data that eventually determines whether or not modules or units need revision.

Through this authority and responsibility, the mentor thus maintains contact with his students who provide him with a continuous feedback of information. This feedback should be used to guide the revision efforts on modules until 90% of the students taking unit post-tests achieve a minimum of 90% accuracy on the first try.

This revision-and-maintenance action should also receive impetus from planned weekly meetings between proctors and mentors -- wherein the effectiveness of the course content, progress tests, and post-tests are discussed and whereby actions are decided upon.

11. *Tracking Student Progress*

One of the weaknesses of individualized instruction is the problem of procrastination.

Students who emerge from the conventional system in our public schools are not usually trained in managing their own time. They are accustomed to having others manage their time for them. So, when they have their first experience with self-paced instruction, the most difficult thing they encounter is plotting and planning their own activities to insure that they finish the course in a reasonable length of time.

Therefore, student judgement should not be relied upon to determine what constitutes a reasonable length of time. Instead, a system should be installed to keep track of students and their progress. It may be a combination of systems successfully used by others. For instance, Dr. David Borne of the University of Utah uses a plotting chart. Dr. Tosti of Independent Learning Systems, Inc., uses carefully-designed motivators that reward students when they form the proper behavior. Whatever system is used, it should contain the following elements:

..... The proctor should be required to submit an attendance report for each student every week.

..... From these reports, the mentor checks each student's frequency-of-attendance. If he finds a student has not taken a unit mastery test within three weeks, or he has not made an appearance within three weeks, the student should be sent a letter and/or called on the telephone.

..... The mentor should ascertain why the student has not reported and remind the student of his "time plan," urging him to make an appearance within the next week.

..... If, after three weeks from the first call (six weeks altogether) the student does not show, he should be dropped from the course, provided the reason is not a valid one.

This is the system used at Brookdale Community College in New Jersey, as described by Dr. John Gallagher, Brookdale's Vice-President of Academic Affairs.

"... *It is a very effective system,*" he reports, "*in that every student is kept track of through the entire course.*" Very few students at Brookdale procrastinate beyond the three-week period and usually show up after the first call to them.

Mentors should inform students that, since time is relaxed in the self-paced system, a student may take an occasional respite from his studies for any reason as long as he doesn't over-do it.

12. *Grading System*

A grading system based on achievement testing, per se, should not be used to grade self-paced students. By definition, achievement tests only estimate the amount

of learning that has taken place by sampling the content of relevant instruction.

Learning-for-mastery is the major objective adopted by many advocates of individualized instruction. Therefore, only criterion tests, which are based on the objectives of a course, should be used to not only measure achievement but to act as a diagnostic tool in determining which learning modules, thus which objectives, have to be reviewed to achieve mastery.

Since the mastery contingency (a system in which a student can progress only by mastering each step) should be adopted, it will be difficult to justify giving a student less than an "A" for his final grade.

However, if some mentors disagree or there arises administrative objectives to this, an alternate grading system can be used, but one that does not disturb the mastery contingency concept.

Dr. Harrisberger recommends using "numbers-of-units-completed" to determine the grade. For instance, the "A" grade may constitute mastery of 16 units of a particular course. If, however, the student elects to do only "B" level work, he will be required to complete, for example, 12 units of

that course, at which time he may take the final exam comprising the criterion test items of those 12 units.

For subject areas of very minor importance to the student, an instructor or mentor may decide to offer a "C" grade which, too, would constitute the completion -- on a mastery level -- of a certain number of modules and units in a hierarchy of modules and units for an entire discipline.

If, however, the student is pursuing a course in his major area of study, he should be strongly urged to achieve mastery on all units constituting an entire course. Also, each course should be cap-stoned by a final exam, the results of which should also have an effect on the student's final grade.

If the student shows less than mastery on his final exam, he should be told that he will receive a final grade of less than an "A". If the student decides that he would rather receive an "A," he should have an option to restudy those modules and units -- as shown in the exam -- that cover the data that the student failed to master. If the student chooses the latter, the mentor should write up a diagnostic and prescribe a review program for

the student who will then go off and study only those areas outlined in the prescription.

When the student is satisfied that he can pass another version of the final exam, he reports back to the proctor who then gives him a second final exam, based only on the areas of understanding that he did not grasp the first time around.

A student in a major area of study should not, however, settle for less than an "A" in that course. Nevertheless, he should be allowed the option of accepting a "B" if his reasons for not pursuing the "A" grade are sound.

Since every course should require mastery of each unit, the final exams should be composed only of questions related to concepts which have been already mastered by the student. A base recommendation ,that should be made to all instructors and mentors is to require at least a 90% mastery on each unit test and at least an 85% on the final as the standard for receiving an "A" grade.

13. *Recording the Grade*

The conventional system for registering grades at the average college has the time restraints of

12 to 16 week intervals. That is, the registrar requires a grade for each student at the end of each semester. If the current system is not to be disturbed, students who have not completed the course within the conventional semester should be given a grade of "IP" (In-Progress). This grade, communicated to the registrar, will indicate that the student is taking more than one semester to complete his course or that his studies over-lap two or more semesters.

The grade of "IP" however, should not be automatically converted to an "F" if the student does not complete his studies within the time generally allowed for completion.

Students should never be given a failing grade in any class. At worst, they should receive no grade at all. The student receives a grade and credit when, and only when, he completes his work successfully. If he doesn't complete his studies in the required time, he should be merely dropped from the roles or given a fresh start.

This point of view eliminates the need for the grades of "Incomplete," "Withdrawal," and so forth.

The policy behind "self-paced, individualized instruction toward mastery competency" is that if the student fails the first time, he is given another chance to succeed and another and another. If he does not succeed within certain time constraints, this fact is just never recorded on his transcript.

14. *On-Going Procedures*

Occasionally, a mentor may gather together the students who have reached a certain level of learning for a special lecture or demonstration. Also, the professor may arrange at certain times special tutoring sessions for individual students who are having trouble in a certain area of learning. In the main, however, learning should be a student action, accomplished by the individual.

The student continues the foregoing procedures throughout his stay in self-paced courses: receiving his learning modules; issued (when necessary) the required audio-visual materials; completing the required work at his own pace; reporting to his course mentor or proctor for checkouts; repeating all failed parts of the learning module; and after completing the learning modules with "mastery" understanding and the ability to apply the data learned, receiving the next learning module to repeat the process again.

15. *Graduation*

Graduation should come at the student's own time, monitored by his own motivation, with time out for an occasional illness or trip to Fort Lauderdale. Graduation should occur when it comes, as the student's individual triumph, not as one of many in an assembly-line of graduates in June.

16. *Student-Faculty Contacts*

The amount of time a faculty member can spend with students is determined by what other duties he has to perform. For instance, if he is designing new course modules while, at the same time, managing instruction, it is obvious that the mentor will not be able to spend time with many students. In this case, proctors take on most of the para-professional duties and relieve the professor of these chores.

If the mentor is merely field testing and reviewing modules while managing instruction, a great deal more of his time can and should be spent with his students.

During normal operations, however, a mentor should spend approximately 20 hours a week with his students assisted by proctors who maintain a 30-hour

week schedule. These 20 hours of contact could take place where the students are studying or privately in the professor's office.

17. *Student-Teacher Load*

Since an institution must operate with a certain student-teacher ratio, -- say 20 to 1 -- to meet dollar constraints imposed by the state or other governing bodies, the institution's, student-faculty ratio should be the beginning point at which a faculty member's student-teaching load is determined. If, as in junior colleges, the average student carries approximately 15.5 credits per term, the faculty should then generate 20 times (institutional, student-teacher ratio) 15.5 credits (average student's load) per term. Stated in another way, each mentor should generate 310 credit hours per term on his own. If the mentor is using a peer-proctor-managed learning environment, it is recommended that there be one peer-proctor for every 15 students in the course. Therefore, a teacher generating 310 course credits per term will require approximately seven proctors.

However, when paid proctors are being used, few colleges can afford the luxury of having one proctor for every 15 students. This would make the cost-effective picture quite undesirable. It is

recommended, therefore, that paid proctors begin to be utilized when student enrollment starts exceeding the 310 credit-hours generated by the average teacher. The amount of revenue generated by the additional students will determine the number of paid proctors that can be hired, based on an established hourly rate of pay.

For instance, if each additional student entering a mentor's responsibility generates $40 of revenue per term per course and each mentor is paid $3 a hour for 450 hours per term ($1350), 34 new students would need to be added to the group before one proctor would be hired.

In other terms, a mentor for the first 133 students would be allowed one full-time proctor. For each additional 33 students thereafter, he would be allowed an additional proctor.

Of course, the foregoing is recommended only when strict adherance to costs are imposed upon the college. Most of the consultants recommended that the ratio of students to teacher and students to mentor be considerably lower than that imposed by "conventional" dollar restraints. Their rationale is that the effectiveness of instruction increased by the mastery concept is a far more important consideration than the cost of instruction. The quality

of students graduated per dollar cost is far greater in individualized instruction than in the conventional system.

18. *Stipend Considerations*

Instructors working in self-paced learning environments and under the individualized mode of instruction take on different roles and different responsibilities. When they are called on to design learning modules as well as manage instruction, they need, by necessity, be a much more highly trained pedagog than is required under the conventional system. These additional responsibilities and skills should have additional dollars attached to them in the form of pay increments.

If, however, mentors are merely required to be subject-matter experts and only called upon to manage instruction, they should then be paid the same stipend as given to those faculty members conventionally employed.

19. *Course Mentor -- The Teacher's New Role*

The main obstacle to learning in the conventional system, at least on the college level, is the

lecture method. Many professors merely lecture to a class and try to teach in this way, but a class is not a person and never learns anything. Only students learn, and they are all different. The main effect of lectures as a total method for teaching is that the professor is taught his own subject.

One of the important outcomes from adopting self-paced instruction is that classroom lecturing is almost totally abandoned. A professor puts his lectures on tapes or uses other media and seldom gives a live lecture unless he has something new to say or a new way to say it.

Additionally, the professor's role as a teacher is expanded to the degree that he would be better called a "learning technologist and manager." Since his new role will be to design and produce learning packages and to manage instruction, he requires a greater number of pedagogical skills (or at least a familiarity with these skills) than heretofore needed by the classroom professor.

The faculty member's role has changed most significantly, however, with instruction itself. In the conventional system, the faculty member's role is primarily that of a disseminator of infor-

mation. In the self-paced system, the faculty member's role becomes that of a manager of a learning environment in which his responsibilities are to determine objectives for courses; to determine what learning resources and activities will assist the student in meeting those objectives; to develop valid means of evaluating achievement of objectives; to provide assistance to students wherever necessary in meeting these objectives; to provide motivation to the student to work through the various instructional activities prescribed to make sure that the system is operating; and so forth.

In short, the new role of the teacher will be to become well-versed in how people learn and the existence of the many media and methods scientifically designed to aid and enhance the student's learning. Also, the professor must become satisfied with fewer ego-trips to classes containing captive audiences and allow the student to change his role from a "passive container" waiting to be filled with knowledge to a much-more active member of the teacher-learner partnership.

Chapter Two

INDIVIDUALIZED LEARNING CENTER

Since learning can take place anywhere, a learning center is merely an area that makes the learning process easier by its conveniences. It may contain display media in the form of hardware, but this is not the reason why it is a learning center. It is one because it provides for more intense student activities; such as, laboratories, group discussions or individualized tutoring. A learning center must also be a place where a student can get feedback on his progress and receive assignments based on the prescription resulting from his performances and needs.

So, a learning center could be a classroom or an elaborate learning-resource center into which libraries have lately evolved. As long as it is a course for information that the student needs, where a student can respond to this information when it is presented, and where provisions are made for frequent and well-informed evaluations and prognoses, the area can be called a learning center.

Dr. Tosti stated:

> *"... A very effective learning center, therefore, may be nothing more expensive than an office or a classroom where students can come to be evaluated on the concepts they just studied (assignments). The form of the evaluation can be oral or written, subjective or objective. Whatever the form, the procedure must be designed so that the student can receive immediate feedback from the evaluation as to the adequacy of his or her responses. The information gained from the evaluation is used to make decisions regarding appropriate assignments (decision). As a final step, the teacher or teacher aids must then inform the student as to the work that should be undertaken next (initiation)..."*

The Center described by Dr. Tosti does not require expensive equipment. All that is really necessary is a room, a student, and an instructor or proctor.

This chapter, however, does not deal with learning centers that are hardly more than classrooms designed to handle one discipline. This kind does not need any more elaboration. Besides, it evolves naturally from the conventional mode of teaching.

We will, however, deal with the multi-disciplined center that has been found to reduce redundancy, costs, and duplication of effort.

In a multi-disciplined center, several disciplines possessing commonalities are housed under the same roof, in which the same functions are performed for all. In this chap-

ter, we will attempt to answer such questions as:

1. When do we decide a multi-disciplined center is needed?
2. How will media flow in and out of a multi-disciplined center?
3. How are study carrels equipped?
4. How are module checkouts controlled?
5. What type of personnel are needed?

Etc.

A. *IS A MULTI-DISCIPLINED CENTER NEEDED?*

The obvious criterion for determining whether a multi-disciplined center is needed would be the answer to, "How extensive is self-pacing done throughout the school?" This seems logical since many self-paced courses on one campus would cause duplication-of-effort and redundancy if they were handled each in its individual center. This is probably the reason why multi-discipline centers have evolved in College IV, The University of Texas of the Permian Basin, Burlington, and Brookdale.

Although Dr. Porter claims that Life Lab does not have multi-disciplined centers, he does state that there are several Multi-Skills Labs on campus. So, this seems to hold true even for Life Lab.

In universities such as Georgetown and Purdue which have only a few self-paced courses, multi-disciplined centers have not evolved. Dr. Sherman has made a uni-

discipline center out of his classroom. Drs. Hurst and Postlethwait have done the same at Purdue for some science courses.

So, it would seem that multi-discipline centers become necessary only when it becomes uneconomical to duplicate classroom centers for each discipline that has become individualized and self-paced.

B. *MEDIA FLOW IN AND OUT*

To reduce the amount of dissemination and traffic that would take place in a multi-disciplined center, College IV has moved all the modules and booklets to the bookstore where they are sold individually to students. Only when hardware is needed does it become necessary to utilize the check-out facilities at the Center.

Dr. Harrisberger states that all self-accessed media at the University of Texas at the Permian Basin are checked out in the same way as books -- whether it be TV, tapes, audio tapes, slides, film strips, or any of the equipment that is used to play them on. All can be checked out and accessed by the student in the same manner books are checked out.

Dr. Tosti states that his learning modules are available in the Learning Center and can be taken off the shelf and used only there. They may not be removed from the premises.

Dr. Tosti advised that this approach be used when the major source of information is in the text-workbook form that the student has purchased. The Learning Center then provides parallel, enrichment, or depth modules.

At Burlington, all the learning-activity materials related to a module are kept in a Learning Center where they are checked out by students. The student identifies himself with an ID card and requests a particular module for a particular course. He then fills out a short form which, in essence, asks for pertinent information. The student receives the material and returns it to the same location. The time is noted in a log each time the materials are checked out and in.

At Brookdale, Dr. Gallagher reports that a computerized check-out system -- called System Seven -- is used for the checking out and checking in of learning materials.

Dr. Hurst reports:

> *"... At the front of each learning center we have a tack board where the available mini-courses are listed and the booths in which they can be found. A little tag is placed over each hook that represents each carrel. The mini-course listed on it is available in that carrel.*
>
> *"A student signs into a carrel by simply taking another blank tag and dropping it over the front of that one, indicating that someone is using that booth. When he leaves, he takes the tag off and frees that carrel for the next student..."*

Although each consultant reported different methods of checking materials in and out, the purposes behind their systems were generally the same. When modules begin disappearing, selling them at bookstores or restricting their mobility seems to be the answer. When hardware is needed, their high cost requires a tight system for accounting for the hardware that is circulating. Whatever system evolves, they seem to evolve for economic reasons, to reduce replacement costs.

C. *STUDY CARRELS*

The need for study carrels is one of the few requirements agreed upon by most of the consultants.

At College IV, student carrels are available in the library and are equipped with two-way, audio-vidio connections. A student may request a given video tape or audio cassette from the carrel, and it will be projected from the AV Center. The AV Center itself also has study carrels with similar capabilities.

The Life Lab houses carrels extensively throughout the campus and contain a wide assortment of equipment for students' use. They do require, however, that every student buy his own cassette recorder.

The Center at the University of Texas at the Permian Basin contains about 200 carrels for approximately 1,300

students. These carrels are divided into ten vidio-tape carrels, 50 cassette-slide carrels, 20 film-strip-cassette carrels, two 8mm loop-projector carrels with cassette playback units and about 100 unmediated carrels.

Dr. Harrisberger reports that the formula for determining how many carrels are needed in a learning center seems to be that about 20% of the full-time students should be able to sit at carrels at any one time.

Dr. Tosti was one of the few consultants who reported that his school did not use study carrels at all. Instead, he provides study tables where maybe three or four students can work independently at one time.

At Burlington, in contrast, there are some 250 to 300 independent learning carrels scattered throughout the campus. Most of these are equipped with cassette players and slide projectors. The majority of the carrels are housed in four independent learning centers of approximately 50 carrels each. These Centers are staffed by at least one clerk-type individual who is there primarily to issue equipment. Dr. Gallagher reports much the same for Brookdale.

The use of study carrels seems to be common among programs using individualized self-paced learning because they are one of the few pieces of equipment exclusively

designed for self-study, and at which all the hardware that are required can be powered. Where extensive use of hardware is not the case, study carrels are needed less, and conventional equipment is used more.

D. CONTROLLING MODULE CHECK-OUTS

One of the questions that requires answering early in the installation of an individualized instruction system is whether learning modules should be restricted to students officially enrolled in the course. The answer to this question determines how elaborate a check-out system is needed.

At College IV, there are no restrictions at all. At the present time, the Center personnel do not know whether a student is authorized to check out a given set of materials. Dr. Toft said that this has not become a problem; until it does, he would like these materials to be available to all students whether or not they have paid tuition.

He stated:

> *"... Many students, we find, are purchasing our modules in the bookstore and checking out the materials to study on their own. They may be doing this as adjuncts to traditional courses in our other colleges. In some cases, they are doing this and then coming to College IV,*

paying a test fee, and a one-shot attempt at mastery. If they are successful, they can complete the work of their degree at about one-half the cost of tuition. We see this as an advantage, not as a disadvantage..."

At Life Lab, however, students are required to have a form on which is recorded the things that they need. That form and their student card authorizes check outs.

At the University of Texas at the Permian Basin, the Center makes available off-the-shelf resource materials, for any purpose, to anyone who holds a student card. But, instructional materials for a particular course are essentially managed by the faculty.

At Burlington, no proof is called for to verify that a student belongs to a group. Since this has not presented a problem, they do not see any reason to require proof. They know, however, that quite often materials are checked out by students who are not enrolled in a particular course but who have heard about them and are interested. They are reviewing them for enrichment purposes.

At Purdue, a student does not have to be authorized to check into a carrel and study. Dr. Hurst said,

"... Really, we don't care because the student is not going to get credit on his transcript until he has enrolled in the course..."

So, there doesn't seem to be a pressing need to install a check out procedure, unless the materials are limited -- in which case they should be reserved for the students officially enrolled in the course. However, most of the consultants recommend that enough materials be provided for use by students other than those on the class roll.

E. CENTER PERSONNEL

A fully functional, individualized-learning center serves the entire campus in that it not only is a place where student instruction takes place, but it is also where instructional materials are planned, produced, and tested.

However, not all learning centers are full functioning. When centers merely house the instructional areas, module-production personnel are not required. For instance, Dr. Toft reports that, at the present time, there is no all-college, module-production laboratory at College IV. However, their Audio-Visual Center does have facilities for producing movies and video-tapes. The Center personnel, however, are either proctors, monitors, or tutors.

The Media-Production Center at Burlington is a rather extensive operation. It is staffed by personnel specifically recruited to perform the unique functions

involved. Included on this staff are such individuals as a media-production coordinator; two or three graphic artists; a veri-typist; one or two photographers; a number of people in the print shop; and a number of miscellaneous production people who do a variety of things related to preparing modules.

In addition to personnel required in the production of modules, there usually are a number of specialized persons who are employed as assistants in science labs or some other specialty.

It was generally reported by the consultants that faculty or media specialists must be readily available to help students learn through appropriate media. A special staff is also required in the production or instructional-development laboratory.

F. *RECOMMENDATIONS*

Every learning center should be started simply, using the most inexpensive means possible to achieve precise objectives no matter how much money may be available for media. The learning center may be started in special classrooms if nothing else is available. But, the major disadvantage of using an existing classroom is the need to set up the materials at the beginning of each class period and to remove the materials when

the class is over. In some self-paced disciplines, such as Biology and other sciences, this would require a wheelbarrow to do.

To solve this problem and when the number of self-paced courses warrantsit, a multi-disciplined learning center should be installed that serves not only as a study area for students in many different courses but also as an area where learning packages are produced.

To provide a college with a multi-disciplined learning center with facilities and services for developing and administering mediated learning packages, three groups should be set up to handle it:

(1) The Course Development Group;
(2) The Course Production Group; and
(3) The Course Utilization Group.

Figure 1 illustrates how the three groups are organized. The discussion that follows is based on this organizational chart.

1. *Course Development Group*

This group should contain a learning psychologist who will collaborate with members of the faculty, or other subject matter experts, to develop new courses and adapt commerically available courses.

ORGANIZING THE C.I.L.

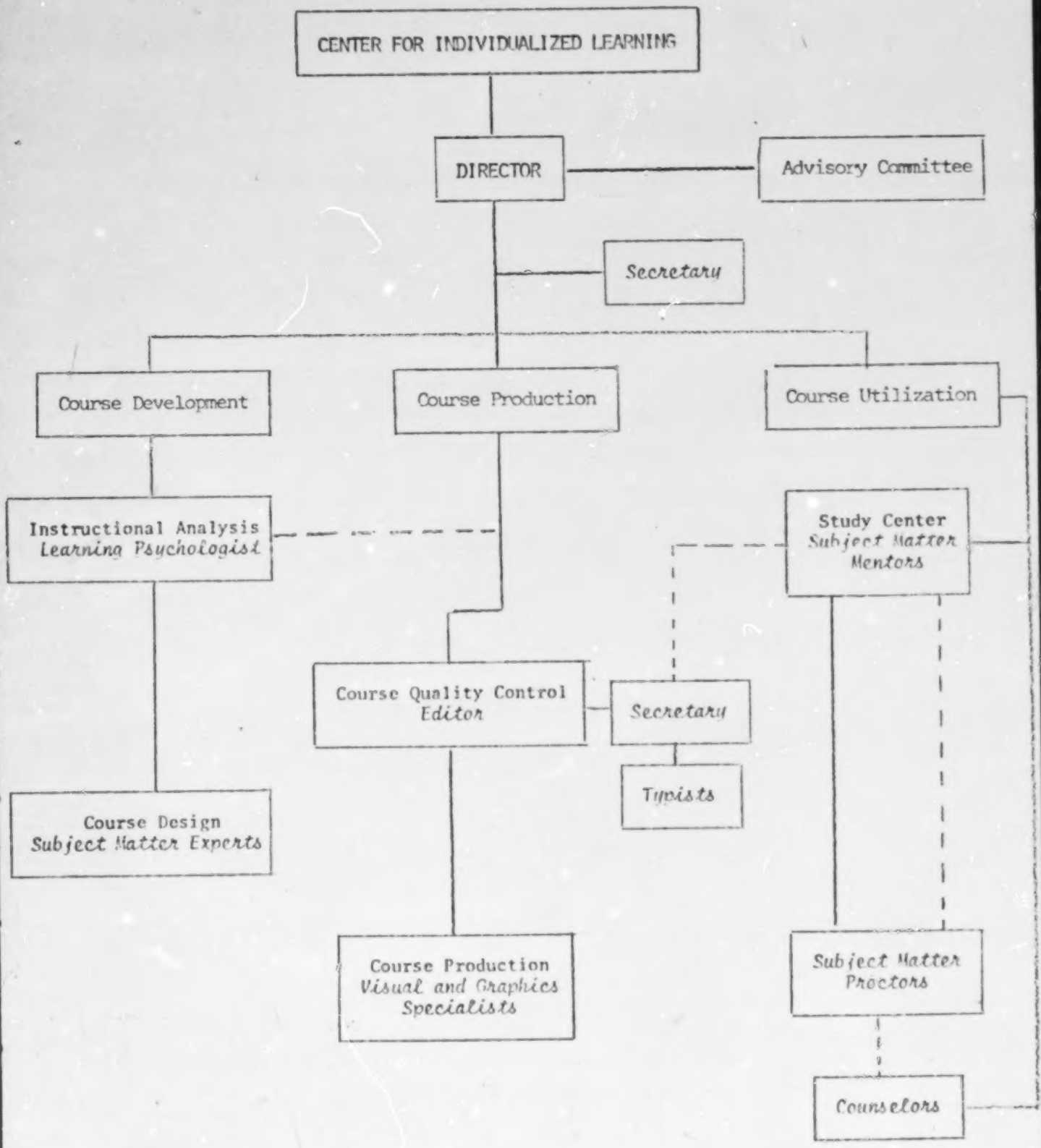


FIGURE 1

For any given project, the subject matter expert (SME) and the learning psychologist should be partners in the instructional design. On rare occasions, the learning psychologist may function as his own subject matter expert; and when qualified, the SME may function as his own learning specialist.

a. Development-Group Personnel.

The learning psychologist should be a person whose background and expertise is associated either directly or indirectly with the psychology of learning, educational psychology, curriculum planning, industrial training, systems analysis, or commercial programming. Additional experience or training in a particular discipline may qualify the educational psychologist to concentrate his major effort with faculty and related subject matter areas. For example, if the learning psychologist has a strong background in mathematics or the sciences, he may specialize in dealing with faculty in these areas.

As the need arises, as the Center grows, more than one learning psychologist or other specialist should be assigned to the Course Development Group.

The subject-matter expert, however, should be a temporary member of the group, recruited from a discipline whose course content is to be mediated. The SME should work with the learning psychologist until the mediated course is completed and field tested.

b. *The Elements of Course Development (See Figure 2)*

After the decision is made to mediate a particular course, the learning psychologist and SME work in joint sessions during the initial phases of the development. In a later phase, the psychologist may write the materials himself or train or assist the SME to do the writing while the psychologist functions as an editor. Finally, the learning psychologist should perform and carry out the validation procedures almost independently, calling on the SME only for special counsel.

Altogether, there should be four distinct stages involved in the development of an instructional package. These stages are summarized as follows:

1. Decision to mediate a course;
2. Analyzing the subject matter in terms of behavior or content;

CHART OF COURSE DEVELOPMENT PROCEDURES

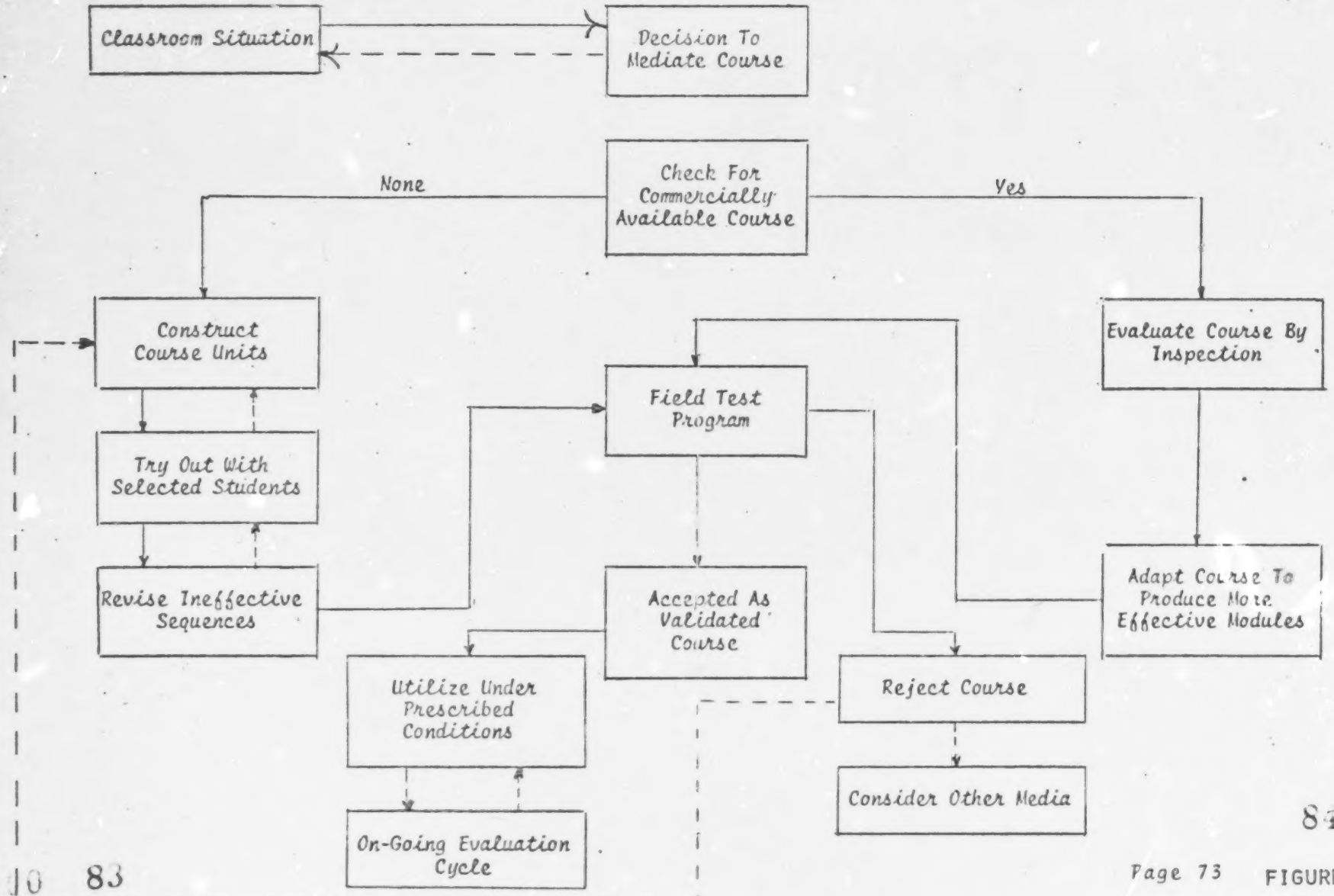


FIGURE 2

3. Producing the modules or course units; and

4. Field-testing the finished product.

The third stage will obviously evolve from the first and second stages, but all three are tied into a number of interrelated activities. The fourth stage, on the other hand, should not be initiated until all previous phases are completed.

In developing courses, the learning psychologist should follow these functions on a routine basis:

1. Consult with SMEs on instructional matters;

2. Apply known principles of learning and strategies of teaching to the instruction design;

3. Integrate appropriate technologies into the solution of all instructional problems;

4. Coordinate the efforts of the SMEs and those personnel involved in the production of the mediated learning materials.

c. *Off-The-Shelf Course Adaptations*

Adapting course materials that were originally developed for other student groups

or for being sold commercially represents another function of the Course-Development Group. Commercially prepared courses are available in a wide variety of topics and at many different instructional levels. Since the time, effort, and cost involved in adapting off-the-shelf materials is decidedly less than developing new mediated courses, the learning psychologist should be instructed to first ascertain the non-availability of off-the-shelf materials before seeking an SME with whom to collaborate in the production of a new mediated course.

The problem will involve, of course, finding courses which have been proved effective and which come close to matching the student needs of a particular college. Where it is possible to select a course that has been developed for a population similar to its own student body and which is based on instructional objectives and content comparable to its own curriculum requirements, the next step should be to tailor the given material into an even closer match through modification and supplements. To accomplish this, the Course Development staff should use a wide variety of adaptive techniques: supplementary programmed units;

supplementary text material; keyed textbook references; simulation exercises; extended practices and review sequences; adjunctive materials; and so forth.

The adaptation of a commercially available course may also originate from the analysis of an instructional problem. In this case, the SME and the learning psychologist, working together, should adapt the course in four stages:

1. Identify and define the problem;
2. Evaluate the selected course by inspection;
3. Adapt the course to better meet the needs of the students; and
4. Field-test the finished product.

In anticipation of such a turn of events, the learning psychologist should set up a routine that will assist SMEs in selecting commercially available courses and learning materials. Additionally, techniques should be devised for adapting commercially available course material to specific student needs.

d. Adjunctive Programming

The primary method of instruction will, normally, be self-contained, multi-media learning packages in which live performances are seldom used. Where parts of a course do not lend themselves entirely to self-contained learning modules, an approach called adjunctive programming may be used.

This program makes use of existing materials as its primary source of instruction around which a programmed guide (objectives, questions, etc.) are built to guide the student through the information. Live instruction should take place only at pre-planned spots in time. Between the periods of live instruction, the students, themselves, seek out the data required to achieve the objectives outlined in the adjunctive materials.

This means that conventional materials, such as textbooks and library books, are supplemented by teacher-made questions and workbooks and used in the same way the self-contained learning packages are used.

In keeping with the elimination of "time restraints" as one of the primary thrusts of self-pacing, students who do not reach objective understanding before the next live demonstration should merely sign up for a future-dated demonstration and work toward that goal.

e. *The Course Development Process*

The procedures that may be followed by a Course Development Group in developing or adapting mediated materials are charted in Figure 2. Each step pre-supposes that the SME and behavioral specialist are either engaged in active collaboration with one another or pursuing individually the paths arrived at by mutual decision.

Each decision to mediate a course should be associated in some way with a classroom problem; i.e., too many flunk-outs or drop-outs, a dearth of effective teaching, a desire to expose a good professor to many more students, not enough students to fill a class, and so forth.

When individualized instruction is on-going, the normal procedure should be for a faculty member to bring the instructional problem to the Center as represented by the solid arrow in

Figure 2. But, there will be occasions when the behavioral specialist, through observation, will identify a problem where none was thought to exist. This contingency is represented by the broken arrow leading back from "Decision-To-Mediate" to "Classroom Situation."

Both the learning psychologist and the instructor should analyze the instructional problem. After the decision to use mediated instruction is made, checking for programs should be the next step.

When a commercially available course is located, the collaborating members, operating literally as an instructional-design team, then evaluates the course by inspection, methodically comparing its record of development, pedagogical features, and instructional content with established standards and college requirements. If acceptable, weak spots in the course are then identified, and adaptation techniques are applied to produce a more effective match with the students who will use the materials.

Should any located material prove unsuitable, the alternate route, as shown in Figure 2, would lead directly to rejection of the course.

At this point, the Course Development Team should try to consider other mediated materials or, perhaps, follow the route that would initiate development of new individualized materials.

When adaptation is undertaken and completed, the new package should then be field-tested among a relatively large group of representative students. The purpose of the field test is to determine whether the program is actually effective and could be used with additional classes or whether it is ineffective and should be rejected as unsuitable for further use.

If successful, the new course is then accepted as a validated medium of instruction.

If the search for a commercially available course turns up nothing, the SME and the behavioral specialist proceed through the steps involved in developing a new course. Construction of modules and units, developmental testing with selected students, and revision of ineffective sequences proceed on a routine basis, as indicated in the solid and broken arrows in Figure 2. Construction, try-outs, and revisions should

function only as interdependent phases in the development of learning modules and units, moving through this loop as many times as is required to produce a mediated course ready for field testing.

When these phases have been completed, the next step is to field test the developed material among a relatively large group of representative students. If all or part of the course is found to be ineffective, rejection of this material should lead back to the construction cycle again.

Final acceptance as a validated course, one that reliably produced a 90/90 proficiency level among the students, qualifies the material to be utilized more widely under prescribed conditions.

After reaching this phase, as illustrated in Figure 2, both the developed and adapted courses should continue to undergo periodic evaluation. Such a revision procedure is necessary to guarantee that rapidly changing academic needs will be met with up-graded, mediated materials.

2. *The Course-Production Group*

This group provides support in designing and preparing the formats recommended by the Course-Development Group for the developed and adapted materials.

In consultation with the learning specialist and the subject matter expert, qualified personnel fabricate mediated materials and modify formats for adapted programs. They select or devise prescribed audio-visual materials, construct simulated exercises, plan and devise subject-matter guides, word lists, keyed references, and other related materials.

The Course Production Staff should be comprised of an editor in charge of production, various clerical personnel, and specialists in photography, art, and graphics. Although a great many of the tasks in which this group is engaged are clerical in nature, a considerable degree of creative effort is involved, dealing with skills very rarely found among SMEs and learning specialists.

3. *Course Utilization Group*

This group should be assigned the responsibility of administering the finished product to students.

A study area should be set aside in the Center to provide for utilization services.

a. Study Area Design

The study area should be designed to administer the learning modules and should have central campus location, possibly in a Learning Resource Center or library. If possible, the faculty should be officed in or near the study area.

This area should also be designed to contain space for: (1) study, (2) monitoring, (3) counseling, and (4) seminars. By accomodating up to 50 students each hour and by remaining open from early morning to late evening, the study area can be available for as many as 3,000 study-space hours each week. Approximately 400 students a week with an average load of 15 credit hours can thus be accomodated. These constraints should be modified, up or down, to accomodate the number of students enrolled in self-paced courses.

(1) THE STUDY AREA

The study area should be furnished with individual carrels equipped with electrical outlets to accomodate the variety of powered devices which may be used in mediated instruction: a tape play-back, a slide projector, a single concept cartridge film projector, and so forth. If TV is utilized, space should be provided for monitors, portable video-tape recorders and video-systems.

(2) THE MONITORING AREA

A monitoring area is needed to facilitate scheduling of students, processing mediated materials for use by students, test distribution and scoring, and record keeping. Although these functions may at first be done by using simple manual and machine data-processing techniques, computerizing each of these functions should be planned for when feasible and when the load is large enough. The anticipated peak traffic flows determine the physical space needed for monitoring.

(3) THE COUNSELING AREA

The counseling area is a separate space or separate room to afford the privacy needed by counselors in orienting students coming into the Center for the first time. In this area, counselors also acquaint the students with the administrative aspects of the courses and discusses subject matter deficiencies that are disclosed either through test scores, progress records, or complaints of difficulty in using certain portions of the mediated courses.

(4) SEMINAR AREAS

Seminar areas should be provided to accomodate regularly and irregularly scheduled groups assigned to use the same module or to hear the same lecture. Supervision should be under the study-area personnel -- in most cases, the mentor.

b. *Study Area Personnel*

Mentors, during a course production year, should be assigned to the study area on a part-

time basis mainly to supervise the field testing of the courses they mediated while a member of the Course-Development Group. Later, however, when self-paced instruction becomes more prevalent at the college, mentors should be assigned on a full-time basis.

Directly answerable to the mentors are the para-professionals, better known as proctors, who should be assigned full-time. Proctors disseminate the mediated material, test students, and perform diagnostic and prescriptive services.

In conclusion, the aforementioned descriptions are for a multi-disciplined, full-service learning center that should evolve out of a growing use of self-paced instruction.

Chapter Three

ADMISSIONS

The purpose of "admissions" is to serve as a connecting link between those seeking an education and those providing it. It deals mainly with informing the community of the College's programs-of-study, courses, and pertinent logistical and financial information. It accepts applicants who meet specific entrance requirements and gathers the data that forms the basis of student records that are processed throughout the student's stay.

In short, it is the duty of the admissions official to let people know that the college exists and what it offers. Secondly, he actively recruits students and tests them against admissions policies. The accepted student becomes the output of this sub-system and eventually becomes the input of the registration sub-system.

A. *APPLYING FOR ADMISSIONS*

Installing an individualized instruction system should cause little changes in the admissions sub-system currently in use. All of the consultants agree that a college should adhere, as much as possible, to its traditional way of performing admissions functions.

Dr. Gallagher of Brookdale Community College, however, stated,

> *"... throughout the recruitment process, the students should be made gradually aware of the nature of the college and the fact that it does pursue an individualized learning approach..."*

Since the prospective student cannot fully understand the implication of this, Dr. Gallagher further recommends that the information about individualized instruction be indicated on all recruitment materials and should state that students will follow a method of instruction and a method of learning that is individualized rather than lock-step.

It is important that this information be part of admissions and, prior to that, part of the recruitment process because students should be made aware that they have an option to enter into a different kind of learning system that may better meet their particular needs. This information, as part of recruitment-admissions functions, should have the desired effect of increasing the number of admissions applications by attracting those who are normally "selected out" by the conventional system; i.e., shift workers, housewives, institutionalized, seasonal workers, and such.

B. ADMISSIONS REQUIREMENTS

Dr. Toft of College IV states that each college that makes up the cluster of state colleges in Michigan has its own set of admissions requirements. Generally, these requirements are designed to find out whether the applicant has the ability to perform at a

college level that he is at least age 21, and that he possesses a diploma from an accredited high school.

Dr. Sherman of Georgetown University states that entrance requirements at Georgetown are necessarily high since they compete with universities such as Harvard, Yale, Penn and such.

Those consultants mainly associated with junior colleges -- Drs. Hammons, Gallagher, and Porter -- have stated that admissions requirements should be kept to a bare minimum -- that junior colleges should have an open door policy, accepting anyone 18 years of age or older.

Ideally, the student should have a high school diploma either through G.E.D. examinations or through regular matriculation; but this should not be a requirement for admissions.

Most colleges pre-test students to determine abilities for placement in one of several levels of instruction. Most junior colleges will accept students with below-average abilities, placing them in remediation courses.

C. FORMS AND PROCEDURES

In most schools surveyed, demographic information is taken from the application form; so the first form involved is the one the prospective student fills out when he requests admission to the college. If the student is admitted, some proof-of-acceptance form

is given to the student as a validation of his acceptance. This proof-of-acceptance is the second most-commonly-used form.

At the University of Texas, the student's records are sent directly to the college for assignment to an advisor.

At Brookdale, admission-application forms are designed to be machine readable because of their elaborate management of the information system in use at the college. Generally speaking, however, the forms used in the admissions process usually consist of an application form, a data processing form, a master record form, and a validation-of-admissions form. These forms are used to standardize the procedures of the admissions office.

D. OUTPUT OF THE ADMISSIONS SUB-SYSTEM

Of course, the admitted student is the output of the admissions sub-system and becomes the input of the registration sub-system. A student does, however, have to prove to the registration official, in some way, that he has, indeed, been admitted to the college. This proof may come in several forms.

At College IV, the student uses his letter-of-admissions as well as his name appearing on an official list to prove that he is eligible to register.

At Life-Lab, admitted students are issued a receipt for a pre-admissions fee that serves as their proof.

At the University of Texas, students are given a registration packet, the possession of which serves as proof to advisors that they have been admitted.

The other consultants state relatively the same sort of answer to this question. In some way, information is conveyed to the registrar, to a counselor, or to an advisor that state that the student has been accepted, has passed through the admissions procedures, and is ready for registration.

E. RECOMMENDATION

A student's first experience with the college is at the admissions office. At this time, the student is full of doubts and fears; and because of this, he should be given a full reality on what to expect. When designing an admissions sub-system compatible with an individualized instruction system, it is important that it be planned properly and that the final system does, indeed, inform prospective students on the pecularities of self-paced, individualized-instruction.

Additionally, remediation modules, representing lower levels of each freshman course, should be included as part of freshman course packages so that the "open-door" does not evolve into high attrition and few graduates.

The student-record-keeping procedure should start at the admission office with the taking of demographic information from application forms that are compatible with the data processing

system used in the college. The student-information-recording methods should be mechanically or electronically handled because of the large amount of record keeping imposed on the college through frequent assessments and prescriptive routines contained in good individualized instruction systems.

When the student completes the admissions routines, a letter or form should be filed that indicates that the student has been admitted to the college. This information should be communicated to the registrar and, if necessary, to counselors, advisors, and division heads.

Additionally, the student should be issued a validated form that will be, in effect, his permission to register.

An admissions system used in schools that are conventionally operated should not be scraped just because a second instructional system has been added. Conversely, it should not be so rigidly designed and adhered to so that it cannot be modified to meet the pecularities and requirements of an individualized instruction system. No instructional system should be made to conform to an existing sub-system. This is tantamount to having the tail wag the dog.

Chapter Four

REGISTRATION

The registrar is the keeper of students' academic records with full responsibilities for generation, storage, and use of these records. Also, he is responsible for the development of a master schedule of courses to be offered during a particular academic period. But, his main output involves statistical reporting and transcript production. The registrar is responsible for issuing transcripts to any student or former student requesting them. Additionally, his work involves reporting to the president, academic deans, or other administrators on the status of student enrollments and academic achievements. These activities, by necessity, involve an extensive responsibility -- through data recording and storage -- for the development and care of student academic information.

The registrar becomes most visible, however, when he performs the activity of registering students into courses printed on the master schedule. This registration period usually takes place just prior to the opening of classes when students receive, confirm, and present for the up-coming academic term their individual class schedules.

Because of these extensive responsibilities, registrars are prone to insist on routinizing their functions so that special things

are done at special times. This is probably the reason why registrars resist -- more than any other official -- the type of individualized instruction that requires open scheduling and open registration.

Registrars inherently regard the wide-openness of registration systems required by individualized instruction to be extremely difficult to handle, requiring sophisticated methods of processing data, with turn-around time being of paramount importance. Therefore, it behooves the designer of a total educational system that is based on individualized instruction to be extremely accurate in designing the sub-system and routines of a registrar's function.

With this in mind, consultants were asked the following questions about their schools:

1. How does pre-registration counseling take place in an individualized instruction system?
2. How is a student given permission to register?
3. What are the forms and procedures involved in the registration function?
4. How does a student prove that he has gone through the registration system?
5. How is open registration conducted?
6. What are the permissible student course-loads?

The answers to these questions were broad-based and general in nature. We have left the designing of specific routine functions to the discretion of respective registrars who use this information.

A.. *PRE-REGISTRATION COUNSELING*

At College IV, Dr. Toft reports that students get advice about scheduling, curricula, and courses through a student-orientation advisor. An incoming student is given an orientation booklet and views a video-tape on the College's individualized-instruction system. Later, the student is assigned a faculty advisor who helps design his or her specific program and curriculum.

At Life-Lab, the advisor is called a "programmer," and does much the same thing as faculty advisors do at College IV.

At the University of Texas, Dr. Harrisberger reports that each student is assigned a mentor who serves as the student's advisor and counselor for his entire period with the University. The mentor helps the student design his entire program-of-study and monitors his progress throughout his stay at the University.

At Burlington County College, Dr. Hammons states that the primary source of information is contained in printed documents such as the college catalog and a booklet called, "Registration Procedures." These documents are interpreted for the students by either a counselor or a faculty advisor.

At Georgetown University, there are three or four people on the payroll who work full-time in terms of curriculum counseling. Departmentally, however, one member of the faculty is designated as "Director of Undergraduate Studies" and acts as an advisor for that department's disciplines.

At Brookdale Community College, the student goes to a student-development specialist who performs the duties traditionally assigned to a counselor. However, the student-development specialist is seen as a person who helps the student proceed through an individualized learning system, not merely a resource for students with problems.

At Purdue, about June of each year, the student receives a questionnaire from the school asking him to indicate some dates on which he could come to the campus for a so-called "Day on Campus." At that time, the student is assigned to and meets with a counselor who helps him with scheduling and course selection.

B. *PERMIT TO REGISTER*

When Dr. Toft was asked, "How does the registrar in your school know that the registering student has been authorized to enter classes for which he is registering?" he stated,

> *"... At the present time, there is no way of checking to make sure that a student has the necessary pre-requisites before signing up for a given module..."*

This answer was typical of the type of answer received from the other consultants and represents, probably, the most common flaw in the registration systems studied. Students who become "institution wise" are quick to take advantage of this flaw by: (1) registering for courses for which they do not possess a pre-requisite; (2) attending classes for which they have not registered; and

(3) generally disrupting the statistic-gathering function upon which funding is based.

For these reasons, those involved with the Life-Lab register their own students and even go as far as collecting the payments for tuition. Dr. Porter stated,

> *"... We are sort of a sub-system to the registrar's office ..."*

At the schools operating totally within an individualized system -- the University of Texas at Permian Basin, College IV, Brookdale, etc. -- some sort of computer print-out becomes the official list of students who are authorized to enter classes. In other institutions, a form containing a signature of a faculty member, counselor or advisor is the primary vehicle used to insure that a student meets the necessary prerequisites of a course..

C. *FORMS AND PROCEDURES*

When the consultants were asked, "What are the forms and record-keeping procedures of your registration system?", their answers were typical of most colleges. Normal "buzz" phrases -- such as drop-and-add, transcripts, computer print-out, class cards -- were repeated. The only differences in forms and procedures were those peculiar to a school with open registration, open scheduling and self-pacing.

At College IV, a "Module-Selection Form" is filled out by a student whenever he or she desires to begin work on a given module.

A second form is the "Daily-Contact Worksheet," filled out by the faculty member, which indicates the number of contacts the faculty member has had with students.

At the Life-Lab, a specialized form is used for registration by mail.

Most other colleges were computer-connected; therefore, all forms dealing with the progress of the student through courses and modules are computer compatible.

The main message voiced by the consultants was that -- because of a minimum-time constraint -- a sophisticated set of procedures and forms is required so that faculty and students can be kept apprised of course feedback information so vital to self-pacing.

D. *PROOF OF REGISTRATION*

The registration system concerns the right of the student to sit in on a particular course for a semester. To determine how this is handled in other schools, the consultants were asked, "What proof does the student have that he has gone through the registration sub-system?"

At College IV, students are given a permit-to-register form. This form is used to verify both admission to the school and payment of tuition.

For each course selected, a student is given a copy of a payment (NCR) form which also verifies registration.

At Life-Lab, a receipt-for-payment is proof of registration.

In schools that use a computer in its data processing functions, a student is given a copy of a computer print-out that shows, officially, that he has been admitted and has paid for courses for which he registered.

Dr. Sherman stated that, at Georgetown, a computer print-out class list serves as proof of registration.

Generally, the consensus is that students should be given some document that proves that they have been officially registered for the classes they are trying to attend. The consultants consistantly warned against unregistered students walking into a classroom and, in one way or another (because of the weakness of the system) getting their names into the machinery and ultimately on the official class list. This weakness, inherent in many systems, does a great deal to render statistics invalid.

E. *OPEN REGISTRATION*

College IV is one of the few colleges in the land that allows students to register anytime during the year, with minor exceptions such as Christmas and holidays. Most other schools, according to the consultants, restrict open registration somewhat.

Dr. Hammons stated that in his extensive travels throughout the country, he found very few institutions which have made much progress in what we would call "continuous registration." Nebraska

Technical Institute and certain Canadian colleges were among the few exceptions.

Each of the consultants agreed that the notion of a student being able to register at anytime during the year for even one course sounds great in theory but presents substantial problems in implementation because of having to deal with state reports and internal procedures of a traditional institution. Besides, in order for a student to enroll in a course at any point in time, it is necessary for all the units within the course to be available to students at any point in time. When this condition is reached, open registration is necessary.

Dr. Gallagher stated that,

> *"... open registration is a fact at Brookdale because it is critical to our individualized learning system. Any student who completes a course early should be able to join another course immediately thereafter..."*

To handle this, Brookdale has installed a process called "Continuous-Progress Registration." Courses which are self-paced are identified in the master schedule and in the catalog. Students enrolled in self-paced courses are allowed to enter the continuous-progress-registration process.

Dr. Gallagher also said,

> *"... a continuous-progress registration is essential to self-paced programs because only thus can students move truely at a pace suited to them as individuals ..."*

He recommends that if state requirements make it necessary to register everyone at specific times, special dispensations should be sought to not only meet the needs of self-pacing but also the statistical-gathering requirements of the state.

F. STUDENT COURSE LOADS

Generally speaking, the tenants of self-paced, individualized instruction do not interfere significantly to the course-load requirements imposed by the average college. Mostly, there is a minimum of from one to three courses to a maximum of 15 to 20 credits.

At College IV, 1/2 credit is the minimum amount of credit for which a student may register; but at present, there is no maximum number. Any student carrying 15 credits is considered full-time for their ten-week terms.

At Life-Lab, a minimum of three courses and a maximum number of five is policy. At the University of Texas, a tentative maximum number of credit hours is set at 20. Other than these differences, the consultants found it unnecessary to change the traditional concepts of student-load requirements.

G. RECOMMENDATIONS

When first installing self-paced instruction in a conventionally designed school, registration should be part of the normal

registration routine used by students registering for lock-step courses. However, registration for self-paced students should be an on-going system that can handle students nearly anytime of the year.

When a student has reached course mastery -- be it in October or January or March or whenever -- he should be allowed to report back to the registrar to enroll in the next sequential course listed in his program-of-study.

His completion of a course should then be communicated to the registrar, through a document, by the course mentor. Later, this fact should be recorded on a computer print-out and, eventually, on the student's transcript.

Students who elect to take individualized instruction courses, whether on a full or part-time basis, should be given an orientation booklet that fully explains individualized instruction.

Students should then report to an assigned counselor or faculty advisor who will assist in mapping out their programs of study.

Some form of pretesting -- designed to place a student into his proper hierarchal level for each freshmen course -- should be given to every entering student. Therefore, each course should contain modules designed to develop its own entry-level skills, rendering remedial courses unnecessary. Those students who enter with poor high school grades or low SAT scores should start each course with

modules in the lower levels of the course. Conversely, the opposite should be true for the more-advanced entrant.

After the student's program-of-study has been mapped out, he should be issued two copies of his program. These will act as permits to register. On them should be listed, among other things, the courses he has agreed to take.

The student presents the "Permit-To-Register" forms to the registrar. The registrar should validate one of the copies and return it. The student should use the validated form as proof that he has gone through the registration system. The second copy should be kept by the registrar as the official document from which data is taken and added to the student's academic file.

Students should be allowed to carry a minimum of one and a maximum of six credit courses at any one time. They should also be allowed to pursue one course to completion or elect to work concurrently on more than one. The decision of how many courses to pursue at one time should be at the discretion of the student rather than his mentor. It is strongly urged, however, that beginning students be encouraged not to attempt more than one or two courses initially. Later on, they may increase their course loads.

Chapter Five

BURSAR

The bursar is the school official who performs the functions involving financial matters and is usually responsible for all collections of and accounting for income from tuition, fees, deposits, and the like.

Tuition and instructional fees are usually paid in advance right after the registration. It is the bursar's job to issue the final document that allows a student to enter classes for which he has paid a fee.

Generally, all charges imposed upon students are authorized by a state agency or a governing board. Only authorized charges are levied.

The bursar's functions in a conventional system generally take place at specific times of the year; but open-registration requires that students be allowed to pay for courses anytime during the year. To determine what changes were caused by open registration, the consultants were asked the following questions:

1. How does the bursar know that the student who is attempting to pay for a course has been fully admitted and registered?
2. What new forms are required for open-payment of courses?
3. How are tuition amounts charged? and
4. What proof does the student have that he has paid for a specific course or module?

A. AUTHORIZATION TO PAY

Generally speaking, bursars require a validated receipt-of-admittance from the student before he will accept fee payments. Conventionally, this receipt is given to the student by the registrar upon leaving the registration sub-system. In open registration, however, students enrolled in self-paced courses commonly pay for a course module-by-module. Therefore, bursars involved with self-paced instruction usually have an on-going collection system whereby a student can pay for a module or a course anytime during the year.

At College IV, all students who wish to pay for modules or courses must have a permit-to-register form which is issued by the registrar's office. This form is issued only after verification that the student is admitted to the particular course or module.

The student indicates to the registrar how many credits he or she wishes to pay for, and a permit-to-register form for that number of credits is issued. This form is then taken to the bursar who accepts the tuition and gives the student a receipted copy.

The other consultants report that much the same type of system is used in schools where instruction is entirely self-paced. In other schools, however, where self-paced courses are offered side by side with conventionally given ones, authorization to pay for a course is usually handled in the traditional manner -- immediately after registration.

B. FORMS

Purdue has one form, containing four carbons, that is used for registration, payment of fees, and class admittance.

At College IV, a permit-to-register form serves this purpose.

In most schools, the forms used to prove a student's registration are quite similar, with the only differences being where module payments are permitted. This contingency, however, merely requires an additional column added to the traditional forms.

C. TUITION CHARGES

The consultants report that no changes in tuition fees are made to students enrolled in self-paced courses. Some schools do, however, accept partial payments for each module completed or each course credit earned. In schools allowing this type of payment, a computerized data processing system is used because of the large amount of record-keeping that results.

D. PROOF OF PAYMENT

Upon entering any course or receiving the next sequential module, students are required to produce proof of payment. Generally, this is in the form of a receipted copy given to the student by the bursar. Where a school must conform to conventional-management procedures, even through they have self-paced courses, it generally used the same procedures that are used for conventional receipting. In schools using computer data processing, print-outs are the official proof of payment.

E. RECOMMENDATIONS

The natural follow-up to registration is payment of course fees; so, upon leaving the registration sub-system, a student should be steered toward the cashier to pay for the courses listed on his validated registration form. A student should be charged the same course fees as charged for conventional courses and issued a receipt to prove that he has, indeed, paid the fee. The receipt should, however, stipulate the exact courses against which the payment was charged.

The receipt should then be used as an admit-to-class permit and be required by the course mentor before issuance of course materials.

In a self-paced system, the student should be allowed to pay tuition on a lump-sum basis in almost any amount. The computer should then be used to deduct the appropriate number of tuition

dollars from the student's dollar balance when a module-selection form is entered or when an entire course is paid for at one time.

Additionally, students should remain enrolled in a course until they complete it. That is, students should be allowed to leave a course, return, complete the course, and get credit for it according to his own time schedule.

If record-keeping is conducted conventionally, students should be allowed to maintain an "incomplete" grade virtually forever by allowing the changing of any grade at anytime through the authorization of an academic dean. In this way, a student will be allowed to pay for a course one time and one time only.

Collections of fees should be an on-going routine to comply with the open-registration recommendation in the previous chapter.

Validated registration forms should be issued that authorize payment for particular courses. Because of this, articulation between the registrar and the bursar becomes critical if statistical gathering is to be accurately done.

It is also recommended that a computer be used "on-line" to record the functions of enrolling, paying, and completing courses. This becomes even more necessary when students are allowed to pay for their course a module at a time.

Forms should be standardized and kept to a minimum number, flowing easily among the registrar, the bursar and the course mentors.

Tuition should be charged module-by-module, or credit-by-credit so that students may pay, if they choose, only for the modules or credits they attempt.

Payments, however, should be accepted in any amounts and be regarded as deposits from which module or credit fees are deducted. This will require a computer program designed to deduct fees from student balances.

Computer print-outs should be used extensively as proof-of-payment and used in place of student receipts. This should eliminate the great deal of paper handling that takes place in a system that requires a student receipt for each payment.

Because open registration is so necessary to a self-paced mode of instruction, the standard bursar procedures used in a school that is adopting optional self-paced courses should be modified to make on-going payments possible.

Chapter Six

BUDGETARY CONSIDERATIONS

There are relatively few administrators in the United States that believe that a self-paced, individualized-instruction system can operate below the cost of a conventional system for the same number of student-credit hours produced. Most academic administrators are convinced that self-paced instruction inherently has to be more expensive than group instruction. They are convinced that the use of media and the one-to-one relationship has to increase the cost of instruction.

Unfortunately, there are very few full-sized working models that have reached a steady-state operation so that cost accounting can be comparative. People like Dr. Harrisberger, Dr. Toft, and Dr. Hammons are, however, convinced that when a learning management system is debugged and operating at a steady-state, it should operate at approximately 50 to 60% of the cost of conventional instruction for the same number of student-credits produced. These administrators are representative of those who feel that this new pedagogy is going to be more efficient in the long run.

In this chapter, we will try to synthesize the few data that are available, most of which was contributed by the consultants to this project. These data were gleaned from the answers to the following questions that were put to the consultants and that comprise the format of this chapter:

1. *What is the "ball-park" figure for establishing a multi-media production laboratory?*
2. *What is the cost of producing a set of learning modules comprising an entire course?*
3. *How many hours of production effort are required to produce one hour of multi-media learning?*
4. *What is the cost-effectiveness ratio that can be expected?*
5. *What equipment is needed in a typical multi-media production laboratory?*

A. COST OF ESTABLISHING A MULTI-MEDIA PRODUCTION LABORATORY

Very little information has been gathered for determining the final cost of establishing a multi-media production laboratory. Too much depends on what a college wants to be done in a lab before a definite cost can be determined.

Dr. Harrisberger stated that if a college is to build a laboratory, the capital expenditure would probably be in the neighborhood of $400,000 to provide a facility that could back up the production for 1,000

students. The operating budget, however, would be in the neighborhood of $75,000 a year, minimum.

"Of course, this is an open-ended consideration," Dr. Harrisberger added. *"You can put as much money in a production lab as you want to; and the more money, the more sophisticated it would be."*

When it comes to costing out the production of a single course, Dr. Hurst claims that he can do a great deal of production for virtually no money if he has the services of a part-time artist or illustrator, a secretary, and a photographer.

"Just part-time," he affirmed, *"you can produce a lot of survival kits for the first go around in a given semester. In fact, you could produce two or three mini-courses a week with that set-up. But, that isn't going first cabin -- it's only minimal."*

Of course, Dr. Hurst is thinking in terms of one discipline, whereas Dr. Harrisberger was thinking in terms of a multi-discipline production lab.

Somewhere between these two opinions may be a firm enough figure to rely upon.

B. THE COST OF PRODUCING A SET OF LEARNING MODULES FOR ONE COURSE

Because there are many opinions about the cost or the expenditures to produce a self-paced course, one would imagine that a firm enough figure could be determined that would be the basis for budgetary planning. This is not the case, however, since the opinions concerning the cost of producing modules are quite varied.

For instance, at College IV, a five-credit course for a "term system" (equivalent to 3.3 credits for a semester system) has an average production cost of $6,000. For a study guide, the faculty cost would be $2,500, bringing the total cost of the course to $8,500 for the entire course. For a fully developed module, the faculty cost would be $20,000, however, bringing the total cost of the course to $26,000.

Dr. Harrisberger stated that production-costs depend on what is designed as a final product. He stated:

> *"... I would say it runs all the way from zero to approximately $1,000 a contact hour, if you are going to go to a full-blown, professionally slick production job..."*

Restating this opinion in terms that conform with those of Dr. Toft, production costs at the University

of Texas at the Permian Basin run anywhere from zero to $45,000 per course. The experiences of College IV and the University of Texas result in considerably different opinions.

Dr. Tosti's opinion, in contrast, is that it would take one professional man-year to create a semester's course to the point where it is an effective package. It would take two man years to put it into publishable form. Depending on the salary of the average professor, we are in the neighborhood of between $12,000 and $45,000 to produce one modularized course.

Dr. Tosti goes on to further break down this figure:

> *"... It would cost about $1,500 to program a week's work to written form. To do it in audio-visual would cost around $4,000. To do it in audio alone, it would cost in the neighborhood of $400 to $500..."*

The opinions of most of the other consultants who had data on costs were somewhere between those mentioned. The final conclusion is that the cost varies so tremendously from faculty member to faculty member, from subject matter to subject matter, and from college to college, that it would be difficult to imagine how it would be possible to come up with a single workable figure for all. The probable conclusion would be

that only colleges that have established a system similar to one already in operation elsewhere could be provided with a valid figure. For instance, those systems adopted by Burlington, Brookdale, and Passaic Junior colleges in New Jersey would have a great degree of commonality. It would, therefore, be reasonable to assume that their costs would be similar. They would differ greatly, however, from the costs experienced by College IV in Michigan and the University of Texas at the Permian Basin. One, therefore, needs to determine which college system his program most closely resembles. The budgetary figures from that college would then be reasonably valid.

C. *PRODUCTION TIME COMPARISONS*

Here, too, opinions are varied. At the University of Texas at the Permian Basin, an hour of contact time takes 40 hours of production time -- if the final module is a slick production. Dr. Harrisberger claims that this figure is quite consistant with the experience of TV studios on major campuses.

Dr. Tosti states that between 50 to 100 hours of production is required for each hour of instruction. His figure seems to start where Dr. Harrisberger's leaves off.

Conversely, Dr. Hammons stated that he has known faculty members who could produce an excellent module on the first draft, while he has seen other faculty members who sometimes require ten hours to do essentially the same thing. It is reasonable to assume that Dr. Hammons was not talking about a slick production.

The highest figure, however, was quoted by Dr. Hurst. He stated:

> *"... It would probably take an average of, perhaps, 120 hours to produce a good mini-course in publishable form..."*

Again, we are faced with different goals, causing different time requirements. The overall assessments of the use of media and the development of a media production facility, however, is to put the emphasis on as much self-accessed media that the average faculty can work with. The common opinion is that the faculty will put much more traffic on media production if it can be done their way, in as simple a system as possible. Effective media can be prepared by the faculty themselves in simple, efficient, and economical ways that have been much more effective than high cost, slick productions so popular today. It seems that the more the production of modules is taken out of the teacher's hands, the more production time is needed and the higher the cost becomes.

D. COST-EFFECTIVENESS RATIO

Cost-effectiveness was found to be determined by a point of view. For instance, whereas the administration of a school will view cost-effectiveness one way, the teaching faculty invaribly views it another way. The administration sometimes exerts too much effort on the cost side of the cost-effectiveness formula. Conversely, faculty have a penchant for over-emphasizing the effectiveness side of the formula.

But, there is another important view point that is hardly ever looked at -- that of the student. Students want a system that is cost-effective to their needs. If students are able to arrange their class schedules to fit their work schedule, they consider this a real cost benefit to them. Thus, if they are able to maintain their regular job and come to campus at differing times, they will be benefited.

One must, therefore, first decide which view point will prevail before an ideal cost-effectiveness ratio can be planned.

Most of the opinions offered by the consultants were generally through the viewpoint of an administrator who is interested in doing the most effective job for the dollars available. These administrators must show a favorable cost-effectiveness ratio for individualized

instruction before the support they require is given. Therefore, each has gathered some data concerning cost-effective comparisons between conventionally operated systems and individualized, self-paced systems.

Dr. Toft feels that there probably will not be any savings in faculty costs in a self-paced system. There will definitely be a savings in terms of equipment and facilities needed.

> *"... The Kansas State and Purdue experience has shown that ten students can use a single lab station in a self-paced system. This means a tremendous savings in facilities and in equipment.*
>
> *"Once the self-paced materials are written and tested, they can be taught and tested by lower-priced para-professionals. In this way, one can use a small staff of highly paid professionals to maintain the quality of the program while directing the work of lower-priced para-professionals doing the bulk of tutoring and testing."*

Dr. Toft goes on to say that College IV is using only 60% of the academic space per student that is consumed normally by their College of Arts and Sciences.

A study done at the Oklahoma Christian College indicates that conventional instruction averages about $23 per student credit-hour operating cost, whereas the learning management of individualized systems ran from $9 to $14 a credit hour actual operating cost. Addi-

tionally, they were able to eliminate 90% of the redundancy of lab equipment and reduce the amount of lab space by 60% without increasing the number of contact hours of faculty needed to run the course. Also, a 25% increase in learning effectiveness for the amount of contact time involved was realized.

Dr. Gallagher reports that the individualized learning system used at Brookdale is comparable in total cost to that of other community colleges.

"There is no increase in costs," he said, *"nor is there a decrease in our opinion. Rather, there is a somewhat different use of resources."*

Apparently, individualized approaches usually mean increased material costs. Therefore, it seems that the only way one can get a more cost-effective result would be to increase the number of students being served by a given instructor. This can certainly be done with individualized approaches.

High volume courses -- such as Introduction to Psychology, Sociology, Political Sciences, and so forth -- can be handled on an individualized basis by one professor. In higher-division courses, where the enrollments are low, a comparable cost-benefit increase will probably be realized.

If we look only at students served and the effectiveness of the system -- that is, objectives obtained per dollar cost -- individualized instruction would definitely realize a savings here, too, because research shows that students do learn more for the same dollar.

Dr. Tosti stated that cost studies generally indicate about 1/3 savings in cost-benefit, which can, of course, be stated in a variety of ways -- either 1/3 more students obtained the same goals for the same dollars or the students on the average obtained 1/3 more goals, or so forth and so on.

Apparently, the "cost" part of the cost-effectiveness ratio of learning-management systems hasn't been fully documented yet. There is a great deal of emperical evidence, however, that indicates this system is going to be highly efficient. Research has shown that it is already highly effective.

E. *MULTI-MEDIA PRODUCTION-LAB COSTS*

The equipment needed in a fairly sophisticated production lab is determined by the desired finished form of learning modules. The following list is by no means complete nor does it intimate that production cannot

be done effectively with less. It does, however, represent a consensus of the consultants who contributed much of the data in this report.

EQUIPMENT

MULTI-MEDIA PRODUCTION LAB

8mm Film Loops:

Cameras:	
NIZO	$ 800 - $ 1,500
BLEX	$ 250
Editing Table	1,500
Synchronizer	800
Sprocketed Tape Recorder	500
Light Kit	400
Cartridge Loader	150
Film Reproducer	500
Film Processor	5,000 - 10,000

Audio-Cassettes:

Recorder	$ 250 - $ 500
Telex High-Speed Duplicator	$2,500

33mm Film System:

Pentax	$2,000

U-Matic Video-Tape

Recorder	$ 1,500 - $ 2,000
Playback	$1,000
Sony Trinitron Viewer	500
Camera	1,500 - 5,000

Print Shop

Plate Maker	$1,000
Offset Press	$ 1,500 - $ 6,000
Typewriter	600
Xerox	5¢/page
Darkroom Equipment	2,500
3m Copy Camera and Stand	500

Supplies . . . . . $ 5,000 - $ 8,000

Personnel

1 Media Producer (Film-Maker/Slide Tape Pro.)	$11,000
1 Graphic Artist	11,000
1 Secretary	6,500
4 Student Assistants (@ 20 hr/wk x $2.70/hr.)	216/wk.

F. RECOMMENDATIONS

Since very little has been done to determine the cost-effectiveness of individualized instruction in comparison with the cost-effectiveness of the conventional system, very little can be recommended of a definite nature. It seems, however, that even though individualized instruction has proved its effectiveness through the findings of over 150 research projects, administrators still require that efficiency be demonstrated also -- even though the efficiency of the conventional system is also in doubt. This, in itself, is not bad since a great deal of visceral thinking has all-too-often guided systems decisions in the past. Decisions should proceed from professionally done analyses.

The future does, however, look bright for individualized instruction. All indicators point to the debunking of the long-held myth that one-to-one instruction is necessarily more expensive than group instruction.

Chapter Seven

EVALUATION OF INDIVIDUALIZED INSTRUCTION

On the whole question of evaluation, one must distinguish between formative evaluation (responding to the feedback from students and correcting the program until it works) and summative evaluation (end-of-study report).

Summative evaluation, traditionally, has operated along two lines: comparison of students between an individualized course and a traditional course, and the comparison -- in terms of a student questionnaire -- of likes and dislikes or happiness with the system.

Almost every school which has adopted individualized instruction, in some way or another, activates an evaluation effort to determine its value and popularity. At College IV, their program included both formative and summative evaluations of their experiment. Dr. Toft had a group of four graduate students from the University of Michigan devote a good deal of their effort to the evaluation effort.

Dr. Porter reported that evaluation is one of the most potent, positive things they do at Life Lab.

> *"... We evaluate everything. We evaluate every meeting we have. We evaluate every seminar we have. We evaluate on the basis that the only way for us to really stay on top of everything is to evaluate..."*

In spite of so many evaluations of instruction, it still remains one of the weakest and least developed areas within the whole process of developing a learning-management system. Dr. Harrisberger stated that, in the many individualized instruction systems with which he is familiar, he has rarely seen anyone paying attention to the whole process of evaluating the faculty's effectiveness, which at the same time is also evaluating system effectiveness.

> *"... You can only go so long in the development of a new system living off the inherent enthusiasm of those involved in the creative development. Eventually, they will want their rewards. It is extremely important that a very systematic and objective procedure be developed to assure that they are adequately recognized for the contributions they made..."*

The real problem begins in overcoming the years of conditioning that faculty have regarding evaluation. Also, overcoming the inertia within the administrative process for an evaluation activity that determines who should receive promotions, tenure, and awards is a problem of equal concern.

Although faculty members should be evaluated in the overall evaluation plan, the system, too, must undergo hard

scrutiny to determine its worth. The primary evaluation of an educational system comes about by answering the question, "Does it teach?"

According to Dr. Tosti, there have been numerous studies comparing individualized courses with conventional ones. Almost universally, they indicate superior learning when individualized courses are used. These findings may cause some colleges to disregard and not plan for an evaluation effort, feeling that very little more can be found concerning the value of individualized instruction.

Dr. Hammons, however, feels that each institution adopting individualized, self-paced courses should install both a formative and a summative evaluation effort using a criterion-referenced approach. He said:

> *"... I think it absolutely essential that goals and objectives in all areas, both affective and cognitive, be established initially for the project and by faculty members within their courses. The primary evaluation, then, would be determined by the extent to which those objectives have been achieved.*
>
> *"In addition, one should look very carefully at other considerations: (1) if the program costs more or less than conventional instruction; (2) attrition rate; (3) student and faculty satisfaction; (4) successes of students in later courses; etc..."*

Dr. Sherman's PSI courses, more than likely, have been compared with conventional courses more than any other individualized self-paced system. In his "Germinal Papers," he states:

"... Evaluations for PSI courses have been done over, and over, and over again at almost all levels of education, with all kinds of disciplines, and in all kinds of institutions -- from Harvard, to Texas, to small colleges, to large universities, state, private, community colleges, and so on.

"We keep getting the same answers: that somewhere between 80 and 90% of the students prefer PSI and the other 10 to 15% hate it; and that, by and large, students do as well, generally somewhat better, sometimes statistically significantly better, than in traditional courses. As far as I know, there is not a single study on record yet that shows that the PSI students have done less well.

"They are not elegant studies, though. They say there are faults with all of them. But, there came a time when there were so many that say the same favorable things, we began to believe them.

"Perhaps 150 of these studies, all saying the same thing, have been published; and there is little reason to work like the devil to provide test #151. Most of those who have been active in individualized instruction agree that enough evaluation has been done already..."

Perhaps this is the reason why the whole trend of research, in the last year, has turned towards what has been termed a component analysis of the system of individualized instruction -- essentially, trying to determine what characteristics contribute to the success -- experimenting with things like unit size, number of units, the importance of review, comparisons between internal and external proctors, and the like.

This component analysis is a very different kind of evaluation of the system itself. Presumably, it eventually

will turn up what the critical elements are that make an individualized course successful so that we can either expand the system or streamline it or modify it or change it or, at least, improve it one way or another,or even not improve it.

A. *RECOMMENDATIONS*

Some form of evaluation of individualized instruction should be attempted during the initial years. The results can go a long way toward the final acceptance or rejection of this mode of instruction at the college, itself. Also, since very few projects are perfectly done on the first try, formative and summative evaluation efforts provide the necessary data for revision and finalizing the system.

Therefore, the college should plan to have all of the intended outcomes -- long-range, short-range, direct or indirect -- thoroughly monitored by an evaluation team. This team should first work with the college in designing a formative/summative evaluation system, the purpose for which should be to test how effectively and efficiently the project meets the objectives for which it is designed.

1. Testing for Efficiency (Cost)

There are several variables that should be used to determine the total cost of each course examined and, thus, the cost of self-paced instruction. The first part of this section explains each variable and gives the reasons for including it as a cost factor. The next section presents a step-by-step explanation of the formula that may be used to compute the per-pupil costs.

a. Cost Variables

The indirect costs for both conventional and non-conventional courses do not differ significantly; therefore, the evaluation effort should limit itself to direct instructional costs only. These instructional costs will represent variations in cost differences between courses under individualized instruction and courses under the conventional mode. The attempt should be to determine the instructional costs, or per-pupil costs, in identical courses in both modes of instruction -- conventional and non-conventional.

(1) Instruction Costs

Generally, a college may define a full-time professor as one who teaches anywhere from three to 15 hours per week -- with some minor exceptions. The cost for a professor's time in any paid course should be determined by comparing the number of his contact hours with his total teaching load for the semester. This percentage should then be multiplied by the instructor's semester salary to arrive at a cost for his time. For example, if an instructor's annual salary is $14,000 his salary for each semester is $7,000. He may receive three credit hours for teaching the course under study and at the same time be teaching 12 credit hours to fill out his normal load. Thus, he is spending 3/15 or 1/5 of his official teaching time on the course in question. Finally, 1/5 of his semester salary of $7,000 will then be charged against this paid course -- a total of $1,400.

(2) Module Production Costs

Generally, the production of one mediated, self-paced course requires at

least four times the effort of teaching (conventionally) the same course; therefore, the college should pay the professors approximately the wages for teaching four overload courses to produce a full semester of work in one discipline. This cost should be charged against the course. If the instructor, instead, receives released time to work on his new course, this too should be treated as an additional cost of the course.

These labor costs should, however, be amortized over a ten-semester period, since this seems a reasonable life for most software (printed materials, audio- and video-tapes, film strips, slides). It is also assumed that, after five years, mentors will likely have to spend time updating their courses and replacing obsolete software.

(3) Para-Professional Costs

Wherever enrollment warrants the hiring of paid para-professionals to assist the mentor in managing instruction, their

salaries, or some portion, should be charged against the courses under their supervision.

If para-professionals are paid on an hourly basis, the total cost for their services should be added to the total direct costs of the course. If these para-professionals participate in the reorganization of the course and receive an extra stipend for this service, this cost should also be charged against the course.

If para-professionals are involved in several courses, however, the percentage of time devoted to each course should be determined, and the cost representing this percentage charged against each course.

(4) Equipment Costs

Two types of equipment may be used: special-use equipment, purchased exclusively for the course; and general-use equipment, which includes sophisticated projectors -- such as sound-on-slide or computer-time.

The cost of conventional audio-visual equipment -- such as overhead pro-

jectors, slide projectors, and 16mm projectors -- should not, however, be charged as a direct cost of the course because the assumption is that these represent purchases of resources for the entire campus.

The charge for general-use equipment depends on student use and should be determined by comparing the number of students who use it with the number of students in all courses using it. This percentage is multiplied by the initial cost of the equipment and added to the total direct cost of the course.

For example, a particular science course may use a number of microscopes totaling $20,000. Throughout the week, 500 students may use these microscopes, but only 100 are enrolled in a self-paced course-of-study. Therefore, only 1/5 of the initial cost of $20,000 should be charged against the course.

Costs for both special and general use equipment should be amortized over varying time periods determined by what represents a reasonable estimate of how

long the equipment will last. In most cases, this time span will be five years or ten semesters. This estimate may vary, however, from a range of three semesters to 50 semesters, depending on the equipment being amortized.

(5) Miscellaneous Costs

The cost of software should be included in the total direct costs of the courses individualized. The costs of these materials may be determined by amortizing their totals over a five-year period or a ten-semester life span. Other miscellaneous costs -- such as field trips, equipment leasing, equipment servicing, and clerical services -- should also be considered as direct instructional costs. In short, any item judged to benefit the students should be charged against the course as a direct cost of instruction.

b. Computing the Per-Pupil Costs

The closest thing to an accurate formula for computing the costs for an individualized

course was published in Toward Increased Efficiency in Community College Courses, written by Dr. Arthur Berchin. To determine the per-pupil cost for a specific course, the following formula was recommended. It takes into account the total number of cost variables previously mentioned.

$$\frac{(B/A \times C) + D + E/F + \frac{(G/H \times I)}{K} + J + L/F}{G}$$

Dr. Berchin delineated a step-by-step procedure, which is too lengthly to include here, but which promises to result in extremely accurate per-pupil costs. Each of the unknowns listed in the formula is defined as follows:

A = Per week teaching load.
B = Hours per week devoted to course named.
C = Salary applicable to duration of the course.
D = Amount paid to para-professionals for duration of course.
E = Stipend or released time given to instructor or para-professional.
F = Amortization period of five years or ten semesters for preparation of course materials.
G = Total number of students enrolled in the course.
H = Total number of students using the equipment.
I = Initial cost of equipment.
J = Initial cost -- special-use equipment.
K = Varying amortization period for generally and specific use equipment.

L = Cost of software materials.

Through the use of this formula, the cost per-pupil is derived by dividing the total direct instructional cost by the number of students enrolled in the course.

2. *Testing For Effectiveness (Achieving Instructional Goals)*

From the beginning of an evaluation effort, much consideration should be given to the learning outcomes of the courses so that the conventional mode can be compared accurately with the non-conventional mode of instruction. The objective data needed to do this are:

1. The percentage of students who successfully complete each pair of courses under their contrasting modes, and
2. The distribution of student grades under each mode.

In this paper, there will be no attempt to structure the evaluation on a strict research design in which socio-economic differences, aptitude, or achievement are controlled for each student. Additionally, there will be no control for variables regarding the instructors themselves and their styles of teaching. In short, no definitive approach will

be used to be sure that differences in instructional effectiveness are the result of the two instructional designs and not from the interaction of uncontrolled student-and-instructor variables. A strict research would cost too much to do for the average college seeking merely indicators instead of absolute proof. Besides, there are the 150 research projects that already prove the effectiveness of individualized, self-paced instruction.

The assumption, then, is that when: (1) grade distribution, and (2) completion factors are used to determine course effectiveness, these factors are enough to indicate strongly which mode of instruction is, indeed, more effective.

Because of this, the objective used to represent the effectiveness in instruction can be subject to criticism by research specialists. The college should, nevertheless, present these data in an evaluation report with the stipulation that they be interpreted only as strong indicators of instructional effectiveness, not certainties.

a. Objective Data

The students who successfully complete each course are those who attain the minimum of

a passing grade. This number of completions is then compared with the number representing the initial enrollment, and a percentage of student completion results.

The grade distribution for each course may be computed in the following manner:

A = 4 points
B = 3 points
C = 2 points
D = 1 point

These averages are multiplied by the number of students in each course who earn each grade. This sum is divided by the number representing the initial enrollment in the course. The resultant quotient will represent the average grade earned by each student enrolled.

b. *Subjective Data*

In addition to the objective data listed previously, subjective data should also be collected by interviewing a sampling of students and each mentor who participates in the evaluation study. Much of the subjective data from mentors should come from instructors who teach courses using both the conventional and individualized modes. They contribute more valuable insights

through their perceptions of how effective their courses are under each mode.

The following questions are typical of those that may be asked of each instructor. They are only typical, however. The actual questions used should fit the overall evaluation plan and needed information.

... *How much time did it take you to organize the course?*

... *How much time did it take you to prepare and revise course materials?*

... *What type of revisions did you make in the course materials?*

... *How much time per week did you spend in contact with students?*

... *How do you evaluate the instructional effectiveness of self-paced courses?*

... *What types of media did you use in your course?*

... *What kind of instructional duties do the para-professionals perform?*

... *How much time does the average student spend in the study center?*

... *Are students evaluated on the degree of their success or failure in meeting course objectives?*

... *And so on.*

The selected evaluation team should refine these questions so that the answers to them strongly indicate the effectiveness of each course and each instructional mode.

3. *Testing the Validity of Instructional Packages*

To insure that a course (a group of learning modules) does what it is supposed to do, an extensive validation effort should be carried out and monitored. Validation should consist of two testing efforts: developmental testing and field testing.

a. *Developmental Testing*

This testing effort begins while the course is being developed. After an SME completes a module, individuals are selected from the target population to go through the instructional module and, afterward, be tested on whether module objectives are achieved.

The test results should be used to pinpoint the problem areas which are the stimuli for an on-going revision effort. This method of testing and revising continues until N = 90/90 is reached (90% of the students taking their first test meet 90% of the course objectives.)

When the final revision has been completed, the module should be edited and polished to ready it for the next phase of validation.

b. *Field Testing*

This testing effort takes place under actual conditions. Large groups should be used to determine if instruction is both effective (teaches what it is supposed to teach) and efficient (will consume as little time and cost as reasonable). These large groups comprise the actual students enrolled at the college. The results of this testing effort comprise the data needed for the final revision of learning modules and act as feedback that triggers the proper action to be performed.

c. *Follow-Up*

After field testing, a course-analysis system should be installed to determine, on an on-going basis, whether the course objectives remain valid in light of new developments in the discipline.

The results of this course-analysis effort will provide the feedback data that insure the perpetual up-to-datedness of the learning modules and individualized instruction system.

Chapter Eight

PLANNING AND IMPLEMENTATION

Most individualized courses operating today were installed as part of an already-on-going, conventionally operated college. The colleges that use only individualized instruction -- such as College IV, the University of Texas of the Permian Basin, Brookdale, and Burlington -- were originally designed to use this pedagogy as its single system for imparting knowledge. They, of course, experienced a different set of problems than did those that individualized a few courses as an optional offering to their students. The fully individualized colleges did not -- at least at first -- experience faculty resistance because the entire faculty was originally hired to work in an individualized system. The faculty of older, conventionally operated colleges, however, do resist because of their college's traditions and conventions that are, by necessity, disturbed when any alternate system is installed. Nevertheless, many problems faced by both types of colleges are common to each other and, therefore, worthy of discussion.

This chapter deals in a general way with the problems faced by both types of colleges -- those initially using individualized instruction from its inception and those installing individualized instruction as an option to its lock-step system.

The first part deals with the planning year and the major activities and events that must be completed during that time. The activities and events of the implementation year are discussed in the latter part of the chapter.

Because Dr. Toft, Dr. Hammons, and Dr. Harrisberger have experienced the agonies and ecstacies of installing individualized instruction in a new college designed for that purpose, most of what follows is a recounting of their separate experiences.

A. *THE PLANNING YEAR*

During the planning year, one should try to anticipate all of those areas of activity that will begin simultaneously with the introduction of the program. Dr. Toft names 12 activities which were common to the experiences of the other consultants. He stated, however:

> *"... The activities I've listed are not, by any means exhaustive, although they are exhausting ..."*

Because of their commonalities, they are delineated first, in paraphrasal form.

First: in the area of curriculum design, one should consider among other things, degrees to be offered, requirements for the degree, and distribution for materials to fulfill the traditions of the degree. At the same time, one should provide specialized training for those not aiming for the degree.

Second: conscious decisions have to be made regarding things to be included and things to be excluded. For example, College IV did not offer music, drama, or physical education since these disciplines were available in other colleges of the same university.

Third: a decision has to be made regarding the disciplinarity versus the interdiscipline natures of the curriculum. At College IV, the use of learning modules and contracts forced them to examine the hierarchy of learning for each discipline.

Fourth: the next consideration deals with the modules of instruction that will be adopted. Of course, the primary mode is the individualized learning module; but, some disciplines will require some form of group discussions and seminars. Others may require a field study on a certain problem that will be entirely left to the student to complete. There is, however, no style

of pedagogy which should be exempt from the system. Any mode that is pedagogically sound should be used or at least tried.

Fifth: another area for study in the planning year concerns the faculty. Things which must be considered in this catagory are hiring practices and objectives; contract form and content; teaching load, promotions, advising functions; professional development; evaluation of teaching performance, and governance.

Sixth: still another area that requires thought and planning concerns the organization of support units and sub-systems. These include admissions; working with the records office or registrar; discussions with the computer-center director to develop specific programs for record keeping and financial supporting; ironing out problems with the business office involving the establishment of student accounts, tuition payments, and expenses; discussions about the library or LRC or audio-visual center involving the use of their facilities; arrangements with the bookstore to stock and sell the modules; arrangements with the print shop to produce finished modules; and the like.

Seventh: another consideration involves the amount of administrators and support staff needed to service self-paced operations. Among the personnel

considered in the structure may include a dean, an assistant dean, a bookkeeper, an administrative assistant, administrative secretaries, faculty secretaries, clerks, student tutors, and lab technicans.

Eighth: of course, some thought should be given to the specialized facilities needed for running a self-paced program. In addition to faculty offices, there should be lab space, provisions for audio-visual viewing, a testing area and perhaps a common room where seminars, discussions, and group sessions can be held.

At College IV, their basic idea is to have all of the faculty offices surrounding a central large room. In that large room, they have a small, glassed-in laboratory where all work with volatile chemicals takes place. There is, also, a series of lab benches outside that area where students can work with things which are neither volatile nor dangerous. The rest of the room is given over to tables, chairs, lounges, and a large glassed-in testing center with tablet-armed chairs.

Nine: another major consideration involves module integrity. Thought must be given to the production and creation of learning modules and the associated lead-time necessary. Validation of these modules also must be considered. Student-feedback is important on the modules, so a module evaluation form should be designed for this purpose.

Tenth: if possible, an outside independent evaluation team should be used to help with both formative evaluation through feedback and with a summative report at the end of the project period.

Eleventh: if it is possible, an outside advisory board should be considered, comprising three to five persons of national prominence in the pedagogy of individualized, self-paced instruction. This board should be used to give focus and direction to the project.

Finally, there is the matter of the budget. It is probably the most important consideration. There will be such things as start-up costs, steady-state costs and, of course, where all these funds will come from. Wherever possible, external funds should be used for start-up costs.

The administration has to recognize that it will take anywhere from three to five years before the program reaches a steady state. When considering cost-effectiveness, these start-up costs should be amortized over a period of at least five years before expecting to have significant cost savings.

Of course, replacement costs for hardware and software will have to be included.

The previous paragraphs represent those areas of agreement among the consultants about planning for the installation of self-paced instruction at a college. Each, however, also contributed uniquely. For instance, Dr. Harrisberger made a strong plea to get courses broken down into a series of learning activities and modules and to well-defined objectives and assessment items. He stated that the course should be taught and debugged until its strategy and effectiveness is qualified.

"Only then," he said, *"are you ready to enrich the course with supplemental media."*

He further advised that the entire program has to be put on line as self-paced instructional units and as an integrated hierarchy of learning modules.

"It is extremely important that each discipline develop an integrated learning hierarchy for their entire program that the student must track through in order to get his degree," Dr. Harrisberger said.

Dr. Tosti contributed more detailed information about the steps involved in the development of a course. In brief, they are:

ANALYSIS: "This involves taking a subject matter apart. If there are hierarchies, they should be generated at this time. It means determining the units and what the contents of the units will be."

PREPARATION OF FIRST DRAFT: "A review of texts or materials that are commercially available should be conducted. If audio-visuals are involved, mock-up story boards should be generated. If a modularized text is to be developed, a first draft of the text should be formulated."

IN-PROCESS TESTING: "Materials should be tested as soon as possible. Even audio-visuals can often be simulatedly tested. This in-process testing requires one-to-three students to go through the materials to see if, as a result of the experience, they can master the unit. The results of in-process testing reveal the weaknesses and the revision efforts that should follow."

IMPLEMENTATION: "This involves specifying what information is needed for each point, generating a few check lists of things to be done, and preparing a proctor's manual and an instructor's manual before start-up. The final phase of implementation is to field-test the modules under actual operating conditions."

In conclusion, all the consultants agreed upon most of the activities that should be planned for during the initial stages of installing an individualized, self-paced system. Briefly, they involve the designing of the entire administrative plan, facilities, faculty, and production of modules.

The decision to commit the college to individualized instruction is a far reaching one, influencing and changing many of the routines that were previously established to operate conventionally.

Also, an individualized-instruction option has difficulty surviving as a separate entity in an ongoing institution. It must, by necessity, be an integrated part of the entire instructional system and supportive sub-systems in the institution. That is difficult to accomplish. Its difficulty has caused more than one university to decide upon a separate college, specifically designed to perform under this single pedagogy.

B. *IMPLEMENTATION YEAR*

During the implementation year, by definition, one puts into operation all the plans which have been formulated the previous year. A review of Part "A" of this chapter reveals what they are and do not require further elaboration. Instead, this section addresses itself to the general problem areas and some "do's" and "don'ts" for this period.

Dr. Toft advises that the director of the program remain calm throughout the year.

Dr. Toft stated that he had to do a lot of hand-holding during the implementation year. The anxieties which all of us fear on our jobs seem to magnify when the program is new and different.

> *"... Everyone will be looking to the director whenever something goes wrong to see how he reacts. If he panics, they will panic. He should be ready to make small changes very quickly. But, he should also resist any basic design changes..."*

The director should also be prepared to protect his faculty from the pressure of those not associated with the program. If there is any way in which the program might appear to be a threat to others, they will find a way to bring pressure on those involved.

"Assume that everyone not connected with the project," Toft stated, *"is looking for ways to define it as a failure."*

Dr. Harrisberger agreed with Toft and also felt that the most important attribute of the implementation is to provide adequate and frequent opportunity for the faculty to get together and close the feedback loop.

> *"... There has to be opportunities for diagnostic remediation among the faculty in their implementation of these new activities. They need the opportunity to share their experiences with others."*

Dr. Hammons, too, remarked that the implementation period will surface a great deal of apprehension and tension among the team. Procedures will need to be established for gathering and providing data with which to review units, compile student evaluation data, and such.

"*Also, during this year,*" he stated, "*you should be interested in documenting, wherever possible, the cost-effectiveness of the program and setting up procedures for gathering the data necessary for making such evaluations.*"

Dr. Hammons further went on to recommend that periodic staff meetings should occur and include "show-and-tell" time in which all team members have a chance to share their successes and failures.

In conclusion, the implementation year is important because there are a great number of things that must be tried. Indeed, any kind of module produced must be field tested, evaluated, and revised perhaps several times during this time. Additionally, all changes in existing supportive systems -- i.e., admissions, registration, financial, etc. -- will require a "shake-down cruise."

C. RECOMMENDATIONS

These recommendations are made with the assumption that the colleges have been commited to installing self-paced learning as a concurrent option with its conventional system. The plan calls for a three-year effort to install a multi-discipline learning center and to mediate all the course offerings of the college. The students will, thereafter, have an option to take some or all their classes in either the self-paced or group-paced mode. The self-paced mode should, however, embrace the individualized-learning and mastery concepts.

1. *The Planning Year*

The first decision one has to make when installing self-paced instruction in an already-operating college is whether to take time, free of students, to design, write, produce and test modules.

Dr. Toft and Dr. Harrisberger did not plan for a full year of preparatory work for their own institutions, and did not feel it was necessary. However, in listening to their comments about their own first year of introducing individualized instruction to their colleges, one gets the feeling

that their respective staffs worked themselves to distraction in keeping up with the student demands since they were attempting to design and write and produce modules a few steps ahead of the students.

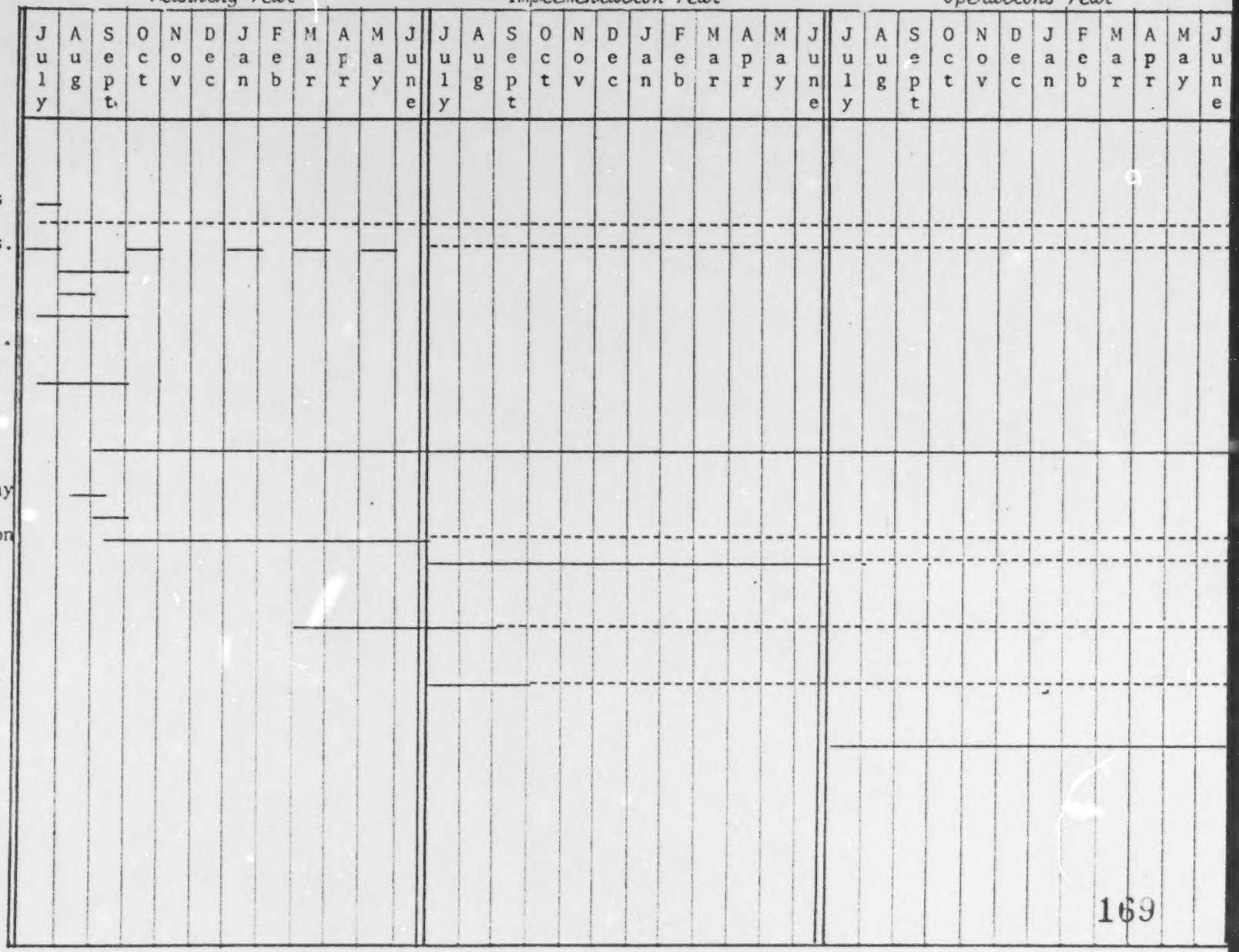
Dr. Tosti, Dr. Hammons, and Dr. Gallagher, however, urged that a college should take a full year to plan and produce modules so that the mistakes they made are not repeated. This chapter is written in agreement with the latter advice.

Figure 1 depicts the main events that should take place in the planning, implementation, and operation years. Part One shows the step-by-step procedure outlines for the planning year. This plan includes start-up activities, an educational-technology workshop, logistics for the Center for Individualized Learning (CIL), and the module production effort.

Part Two explains the start-up for the admissions system, the registration system, and the on-going operations of the module-field-testing year.

Part Three is similar in scope to Part Two but shows a typical operation year that follows the implementation period.

PLANNING, IMPLEMENTATION, AND OPERATIONS SCHEDULE



a. Start-Up Activities

(1) Advisory Committee

A local advisory committee made up of students, faculty members, and administrators should be formed as almost the first action. This committee will have a unique function. It should first meet to plan and plot out a calendar of events and then meet periodically to review progress, to discuss problems and successes, to offer suggestions, and to mutually reinforce one another.

(2) Planning Meetings

In addition to an advisory committee, a group of administrators should be formed to plan and finalize the sub-systems and to insure that the faculty will be supported by a well-thought-out management plan that contains the necessary management forms and procedures that will be used in the implementation year. This will releave the faculty from being burdened with consuming a great deal of energy and time devising systems for handling students.

Secondly, the college should be concerned with the whole task of packaging self-paced learning into a manageable system of units against which the college can charge tuition and that can be recorded on student's transcripts. Once the college has developed an integrated learning hierarchy, the resultant units should be blocked off into credit-hour packages. all the way from one-credit-hour packages to six-credit-hour packages. This should result in an identifying scheme in which the students can enroll, for which they can pay tuition, and for which they will receive acknowledgement on their transcripts.

In any case, the management scheme for charging tuition, giving faculty-load credits and giving transcript credits should be devised to accomodate and enhance the flexibility of the individualized, learning-management system.

Another outcome of the planning meetings should be a detailed events calendar for the year and a tentative calendar for the second and third years. This calendar should be prominently displayed

so that all the staff and students can see it. From time-to-time, during meetings of the staff members involved with the project, reference should be made to the calendar and to the progress toward achieving the various sub-goals within the calendar.

Thirdly, to initiate administrative understanding and support, a one or two day workshop should be held in which the various administrative personnel; such as, the Registrar, Admissions Director, Instructional Deans, Division Chairpersons, and the Bursar, are presented with a complete overview of the project and given at least a thumb-nail sketch of what individualized instruction is all about.

Finally, administrative decisions should be made involving such things as procedures for the implementation year, registration systems, grading systems, the module production system, business-office systems regarding payments of tuition, accounting for students, record keeping forms, and the like.

(3) Hiring New Personnel

Soon after start-up, the college should initiate hiring procedures for the staff and line people who will be involved.

The college should have everyone on board and ready to participate in a learning-technology workshop by the third or fourth week after start-up.

(4) The Educational Technology Workshop

All the new hirees should go through a two to three week workshop to learn the techniques and technologies that are to be employed in the development of self-paced, learning packages. In addition to the workshop, weekly two-hour sessions should be held to determine how things are going.

Some of the topics for discussion in both the workshop and the sessions should include exposure to Dr. Bloom's "Learning-for-Mastery" theory, and the theories supporting it; the rationale and research findings supporting a "systems approach to

instruction;" writing of instructional objectives in all three domains; the sequence of objectives; performance of task analyses; the various taxonomies of objectives; practice in writing and classifying objectives in various levels of the taxonomy; the development of test items appropriate to specific objectives; the exposure of various types of individualized instruction materials; actual experience in developing individualized instructional materials; grading systems compatible with a mastery-learning approach; problems and issues in implementing individualized instruction; and the various sub-systems logistically involved in individualized instruction.

These areas represent at least the minimum content of the workshop. However, the most critical decision to be made regarding the workshop is that regarding the person or persons who will conduct the workshop and their ability to relate to the faculty effectively.

Conducting a two week workshop is no easy task. There will be high points and low points to which the group leader

will have to be sensitive. It is because of the foregoing that the college should not move quickly to a final decision on who will conduct this workshop. It is recommended that outsiders be used to conduct the workshop rather than selected faculty members of the college. Dr. Sherman summed up the reason rather succinctly when he said:

> *"... Faculty don't like their peers telling them how to teach..."*

Among those who have been known to do an exemplary job are: Dr. Gilmour Sherman, Director of the Center for Personalized Instruction; Dr. Donald Tosti, Vice-President of the Independent Learning Systems, Inc.; and Dr. Sam Postlethwait of Purdue University. These individuals have conducted many successful workshops in individualized instruction all over the country.

(5) Purchase Orders

The last item classified under the start-up activities is the purchase of

equipment and supplies that will be needed shortly after the Educational Technology Workshop comes to an end. This means that the college should be prepared to take delivery before the workshop starts or soon thereafter. Therefore, the preparation and dissemination of purchase orders should start as early as possible after start-up.

Before this action takes place, however, each group of materials, supplies, and equipment should be analyzed as to when they will be needed. This analysis will result in a purchase-order timetable that indicates what should be purchased during each of the months of the planning year. In this way, the college will avoid being inundated with supplies and equipment before they are needed. Additionally, the college will have an opportunity for changing direction as to what will be needed when the SMEs have decided the degree of sophistication they will use in designing their course modules.

b. *Multi-Discipline Learning-Center Preparation*

One of the major activities of the planning year is the establishment of a multi-discipline learning-center in which the college will face the logistic problems of media production, checking out modules and materials, quality control of audio-visual materials, layout of the center, inventory control, and so forth.

Because the center should have a close affiliation with a college's Learning Resource Center (LRC), one of the first actions should be to meet with the LRC Director and his staff. Interfacing with the LRC personnel is necessary to insure that a check-out system for self-paced students will be functional. Wherever a module references materials, the center should have one copy or more on reserve in the LRC.

Another important planning matter concerns the space-utilization plan for the center. Much thought should be given to the specialized facilities needed for operating a self-paced program. Its actual site should be in or near the LRC or centrally located. Its design should accomodate, at first, 50 students at one time and

have room to grow to accomodate several hundred. In this way, its design will accomodate thousands of students eventually, in much the same way that one sees in a supermarket. Traffic-flow should be, however, the deciding consideration in determining how large the center will be, initially.

To help facilitate a smooth transition of the facilities into a learning center, the media production personnel should begin to come on board around the sixth week after start-up and take their "set-up" directions from the director of the LRC or of the multi-disciplined learning-center.

These aforementioned activities should be so timed as to make the center available to the SMEs upon completion of their workshop activities, about the eighth week after start-up.

c. *Module Production*

After the completion of the workshop, the college should be ready to get down to

serious business concerning the production of self-paced, learning packages.

This effort is not only the most time-consuming but probably the most important to the success of individualized instruction. Because this is so, the course production effort should be carefully divided into these main sub-efforts: (1) the development of an integrated hierarchy of learning modules; (2) course planning; (3) production of materials; and (4) validation of learning packages. In the design of these learning packages, there should be no style of pedagogy which the college should not attempt, nor should it avoid using learning packages already produced by other institutions.

(1) Integrated Hierarchy

One of the most difficult tasks the faculty will face -- and one of the shortcomings of many individualized learning systems -- is the development of an integrated hierarchy of learning materials for the courses and for the degree programs.

The faculty should be pursuaded, as a first action, to outline a hierarchy of

learning objectives for their course. Secondly, they should work with others in the disciplines (and in the team) to determine whether they are requiring learning activities that are redundant in the students' overall learning plan.

It is then necessary for the faculty to determine for each learning activity the number of prerequisite skills necessary to succeed in that learning activity; also, whether the faculty or the student will be responsible for the student acquiring them.

In short, it is extremely important that those in each discipline develop an integrated learning hierarchy for the entire program the student must track through in order to get discipline completion or a degree. Once this is done, it should be easier for the faculty to pick out those units that they want to be responsible for developing and administering -- those that match their own background skills.

A fourth thing the college should do to make individualized instruction more viable for self-paced students is to modify the conventional, three-credit hour course

and get down to the actual learning skills that make up the entire discipline.

There will be a tendency at this time for the faculty to hang on to the classical courses they have always been responsible for and to try to repackage all their learning units under those same labels. However, because the college will use a modular form of instruction, the curriculum should be sub-divided into multiples of six-credit-hour learning packages down to mini-credit hour learning packages of possibly 1/2 credit value.

In developing a plan of study, the center should not be dealing with four-to-six, three-credit hour packages in each discipline; it should be dealing, instead, with several hundred fractional credit-hour packages. Each of these learning activities, in their own right, should be just as important in the hierarchy as a three-credit hour course. Each should have its prerequisites defined as well as determining its place in the learning track of the student.

With these thoughts in mind, the most significant thing done in about the ninth week should be the development of the integrated hierarchy of learning modules, involving all the participating faculty members. They should be required, in each course, to write their learning-activity modules on a color-coded card. Then, they should put these cards up on a big display board called, "The War Board." (This is the name Dr. Harrisberger gave to his hierarchal display.) The faculty should then look at all the learning units to determine how many are overlapping.

Dr. Harrisberger has stated that when he had his people do this, to their amazement, the Physics and Chemistry faculty discovered that almost 60% of the learning units they had independently derived to be put in their courses were redundant and overlapped each other. It was very easy, then, for them to take the cards that were identical in the two different courses and make them into a single learning unit. What was left was to merely point out to the student that, when he went on to the next unit in Physics or the next unit in Chemistry, he had to have that common unit.

By adapting and adopting Dr. Harrisberger's War Board, developing the learning hierarchy will be more efficiently done for each discipline and will allow for additional enrichment modules at the end of each course.

When the War Board is complete, it should be totally devoid of redundancy.

Another very important thing that will need doing during this phase of modular production is to have the faculty sit down and agree on the terminal objectives for each discipline. For instance, what will be the terminal objectives of a fully trained Accounting major in the discipline of Accounting?

Determining the exit skills of each discipline and, for that fact, each course should prove to be one of the hardest things that the faculty will ever have to face because it will require their coming to a common agreement of what has in the past been controversial.

Once the faculty in a discipline can agree on the exit skills in the discipline,

the kinds of learning activities that are necessary to achieve those skills will then become quite clear. In effect, in developing the learning hierarchy mentioned previously for the entire discipline or for an entire degree program, the faculty will probably have to start at graduation day and work back to admittance day to determine the whole hierarchy of activities.

(2) Course Planning

With a redundant-free "War Board" available, the next step is to set up a course production schedule (see Figure 2) and to develop the individual course modules. This will involve taking the subject matter apart in accordance with the hierarchal breakdown, to determine the unit breakdown and what their contents will be.

It means specifying the behaviors that will be taught in each unit, usually, in a behavioral-objective form or directly into criterion tests. The product at the completion of this phase will be: (1) a

A Typical Course Production Schedule

Module Production & Developmental Testing ——
Field Testing & Module Completion - - - - -

Course		Planning Year			Implementation Year			Operations Year					
		Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer
Accounting I	1	——	——		- - -								
Accounting II	2		——	——	- - -								
Introduction to Business	3	——	——		- - -								
Introduction to Management	4		——	——	- - -								
Shorthand I	5	——	——		- - -								
Shorthand II	6		——	——	- - -								
Typing I	7	——	——		- - -								
Typing II	8		——	——	- - -								
Intro. College Math	9	——	——		- - -								
Business Math I	10	——	——		- - -								
Business Math II	11		——	——	- - -								
College Math I	12	——	——		- - -								
College Math II	13		——	——	- - -								
Intro. College English	14	——	——		- - -								
English Comp. I	15	——	——		- - -								
English Comp. II	16		——	——	- - -								
Western Civ. I	17	——	——		- - -								
Western Civ. II	18		——	——	- - -								
Business Law I	19				——	——	- - -						
Business Law II	20					——	——	- - -					
Economics I	21				——	——	- - -						
Economics II	22					——	——	- - -					
Intro. to Philosophy	23				——	——	- - -						
Intro. Data Processing	24				——	——	- - -						
Psychology	25				——	——	- - -						
Sociology	26					——	——	- - -					
Systems Analysis Prin.	27				——	——	- - -						
Systems Analysis & Design	28					——	——	- - -					

detailed hierarchy chart; (2) documents that specify course content; (3) outlines; (4) unit structures; (5) media choices; and so forth. The most important product of this effort, however, will be the tentative criterion tests developed for each unit.

(3) Production of Materials

A review of texts or materials that are commercially available, including courses that have already been modularized, should be conducted at this time to determine whether they are applicable or adaptable to college use. This is where the expertise of the learning psychologist will be mostly felt. He should be the one who will expose the SMEs to commercially produced packages and, by necessity, should spend weeks four to eight preparing for this onslaught -- which should take place after the end of the workshop.

The faculty should be told at this time that it is unrealistic to attempt to develop fully mediated learning packages on the first try. It is best to make

media selections later. Therefore, the faculty should stick to developing written materials only at first. It is suspected that many of the materials that they will produce initially will have to be redone before they are produced in their final form.

During the initial attempts, the faculty will then begin to realize that mediation "know how" will be needed. At this time, the media specialists in art, audio, and photography should be urged to take on a greater role and to work closely with the learning psychologist and the SMEs.

If the course-design group has decided that audio-visuals are to be involved, a mock-up storyboard should be generated for each module. But, this should not take place until the modularized narrative is developed and the first drafts have been produced.

(4) Validation of Learning Packages

It is expected that the first group of rough modules will begin to appear some

time after the tenth week. If a semester has started, there should be plenty of students available to provide the bodies needed to conduct formative testing. In any case, all materials should be tested as soon as possible to measure their validity. Additionally, every audio-visual item should be simulatedly tested by having students go through scripts and look at crude drawings of the visuals.

Generally, the in-process testing effort will require one to three students of average ability to go through the materials to see if, as a result of the experience, they have mastered the unit test. This in-process testing should be the device used to reveal the weaknesses of the modules.

For instance, an SME may find that he has left out certain important concepts or that he has used language far above what the students can react to. Perhaps the SME will find that he should be using shorter sentences and more basic English. He may also have to increase the number of examples given in certain difficult concenpts. In short, formative testing is

to reveal all the short-comings of a particular module and to provide the information that will guide the revision efforts.

In-process testing, reviewing, and revising modules may continue as long as the developer wishes. However, there should be a point reached where dimishing returns will set in. When then happens, the learning psychologist should signal to the SME that it is time to begin the final production stages of the module and that the validation effort be ended.

Modules should then be reproduced in quantity in preparation for the field-testing effort that should take place during the next semester.

d. Student Admissions

The preparation for admitting students into self-paced instruction should be planned during the administration meetings previously mentioned. The general direction and parameters for the admissions sub-system should have been agreed upon by the middle of the Planning Year.

The Director of the Center should assist the Admissions Officer in formulating the admission of self-paced students into the College.

e. *Student Registration*

The plans for installing registration procedures should be the same as those outlined for admissions. The general parameters are discussed during the administrative meetings, and the specific design of the registration sub-system should be formulated during meetings between the Director of the Center and the Registrar.

A major topic that should be discussed at this time is the set-up of the appropriate type of grading system to accomodate the mastery concept. Plans should be formulated to deal with incompletes, the design of the new transcripts that will accomodate this new form of instruction, the drop-and-adds, refunds, and so forth.

The college, by the fall of the second year, should start registering students. The actual routine for doing this should be the topic for discussion in the final preparation meetings with the registrar.

Initially, registration for self-paced students should not be conducted separately but should be included as part of the normal registration routines. However, unlike registration for the conventional system of education, registration for self-paced students would be, thereafter, an on-going system that can handle students nearly anytime of the year.

2. *The Implementation Year*

The second year should be spent implementing the entire program at the college. This is the year in which all modules are field tested and all of the sub-systems undergo a "shake-down cruise." However, the first year's activities will continue since additional courses will be selected and mediated during the second and third years, too. Approximately six to ten more disciplines should be converted to self-paced instruction during this time.

In preparation for these new courses, new faculty will have to be trained. Their training, however, need not be done by an outside group since there should be, by this time, enough people on staff thoroughly versed in the technology of mediating courses.

Wherever possible, an experienced staff member should be paired off with a new faculty member who will guide him through his initial stages. This entire effort should be directed by the learning psychologist who will also assist in preparing teachers for mediation efforts.

Also during the implementation year, mentors and proctors should be assigned to the center to work under actual conditions and to field test the modules. Ideally, the SME who actually prepared the modules in the planning year should now assume the mentor role.

Additionally, if an organized evaluation effort is planned for the program, the implementation year should show a marked increase of evaluation activities that will be conducted by the evaluation team. Data should be gathered and synthesized during this time period.

The unit-testing routines, established at College IV, should be used as the primary, data-gathering device for this evaluation effort. For instance, each student should be required to complete a module-evaluation form before he is admitted to the testing center to be tested on that unit of work. In this way, student evaluation is included

in the total evaluation effort, resulting in extremely valuable data that can be used by mentors for the revision of modules and by the evaluation team for determining the effectiveness of the modules.

3. *The Operation Year*

The operation year should be much like the implementation year in that new modules are produced, finished modules are field tested, and the evaluation effort is continued. There should be, however, a difference between the third year and the implementation year. Operational problems should be fewer. In fact, the third year should evolve as a typical operational year.

The courses mediated during the implementation year should be field tested at this time.

Lastly, all sub-systems, procedures, and routines should become standardized during this first operational year.

Chapter Nine

CONCLUSIONS

Students sitting en-masse in a collective classroom are different in many respects. Each enters the course with individual entry-level abilities. Each responds differently to the same stimuli in the form of lectures from professors. Each has predetermined concepts which force him to view new data in a different light. Therefore, the lock-step system is not effective for all students because its instruction cannot be geared to meet these individual differences.

Because of this, many have failed to succeed in the conventional, lock-step, educational system; and they continue to fail in large numbers in colleges throughout the country because, figuratively speaking, they are still chained together, following the same formats as though they were all produced from the same mold -- which they are not.

This fact was brought out by one college-wide survey that showed that a good many entering freshmen never reach graduation -- from 40% in some curricula to as high as 70% in others.

A sizeable portion of those who leave before graduation fail to reach the standards needed to pass college-level courses.

The drop-out rate would seem to validate a widely held contention among educators that the conventional system continues to be ineffective for the slow student, and probably boring to the "fast" ones.

Secondly, if post-secondary education opportunities are to be available to all who have reached legal majority, there remains the problem of how to extend the opportunity to those who cannot attend classes at all.

Shut-ins (such as the handicapped, senior citizens, etc.), patients in mental and medical hospitals, and inmates in penal institutions could profit greatly by a post-secondary education. However, because of their low student density -- in that they are scattered throughout a given area -- the cost of providing professors and equipment to each sector of need would result in a great financial burden to the already over-taxed taxpayer.

Nevertheless, public insistance that educators do something for those who cannot attend classes at all is ever on-going and frequent.

Thirdly, a closer look at the lock-step educational system reveals that it is so designed that -- although it

doesn't intentionally do so -- it automatically "selects out" many thousands from a post-secondary education. These additional thousands are people who cannot attend classes on a set-scheduled basis because of "being on shift work" (policemen, firemen, etc.); "being a housewife with erratic hours" (need for babysitters, children's sicknesses, etc.); and "being a seasonal worker" (construction workers, farmers, resort workers, etc.). Since, in a conventional system, all students must attend classes at regular and prescribed times, those who cannot do so are "selected out" from receiving a higher education because they cannot maintain a fixed schedule.

Finally, many industrial firms have educational problems which they themselves cannot solve. Occasionally, their personnel require specialized training to provide needed skills that are in short supply. These skills, however, are so specialized that the inclusion of their subject matter into a college curriculum would be cost prohibitive.

Nevertheless, business firms are looking more and more to colleges, especially community colleges, to meet their training needs.

If post-secondary education is to be responsive to societal needs, these areas of concern must be addressed for solution by finding answers to these questions:

- How can an educational system be so designed to insure the success of the slower student and, at the same time, not slow down the faster student?
- How can its design include the capability of bringing higher education to the shut-ins, the institutionalized, senior citizens, and the handicapped?
- How can its design provide for irregular scheduling of courses and classes to suit the needs of shift workers, homemakers, and the like?
- How can its design solve the short-run specialized, educational needs of local industry?
- Finally, how does its design make this educational system more effective for the same or less tax dollars currently being spent?

Solving these problems has become a major educational objective for many colleges, but trying to force their solutions to fit the constraints of a conventional-educational system proved to be impossible. What seems to be needed is an optional educational service -- complementary to the current system -- that can handle these special problems.

The system that promises to be the most effective has its basis in self-paced, individualized learning. However, its efficiency, though still in doubt, also promises to be better -- in a steady-state comparison -- than the conventional system.

From the student's point of view, in an individualized system, they will find themselves in an entirely new learning

environment that provides for them a multitude of opportunities and benefits. They will find that:

> ... They can take pretests that determine their level of proficiency and, thus, be placed on their proper hierarchic level. In other words, they can begin to learn where their proficiency stops.
>
> ... They can take the mastery test for the module at any time and as often as they need. When they fail to achieve mastery, they will be given a diagnostic feedback to help them prepare for the next attempt at the mastery test.
>
> ... Since a one-to-one student-teacher ratio is maintained, they will have more opportunities for personal contact with their professors, mentors, or proctors.
>
> ... They will be graded on the basis of mastery only, which means that they are no longer required to work toward some arbitrary grading system.
>
> ... They cannot fail, nor be given penalties <u>for not achieving</u>. In this learning service, the environment is totally student-oriented. They just try again.

From a faculty point of view, they will find that their role as classroom instructors in a teacher-centered environment has come to an end. Instead, they will be faced with a challenging and creative experience comprised of the following:

> ... A hierarchy of modules will reveal to the faculty members that many of the same learning tasks are required in different courses. The hierarchy, however, will also reveal the best learning path to be taken for each program of study, resulting in the elimination of redundancy in required courses.
>
> ... They will need to become flexible, to survive in this new learning environment. Since the course may require a variety of media and modes to facilitate learning, their use as instructional devices will need to be mastered by the teachers.
>
> ... They will need to learn to use individualized, diagnostic evaluation of student performance to perform the important task of providing a continuous feedback to the students to ensure the effectiveness of the instructional strategy. Weak programs will need to be continually upgraded and they will be required to teach on a one-to-one

level, between the instructor and the student, instead of on a ratio of 30 to one found in classrooms.

... And, finally, they will be exposed to being more easily evaluated regarding their effectiveness. Individualized instruction systems afford an excellent opportunity for documenting teaching validity and student achievement.

From an administrator's point of view, they will still represent almost the only element in the educational family that is responsible for the <u>efficiency</u> of the educational process. They will want to be sure of the efficiency of the individualized-instruction system as well as its effectiveness, which will be demonstrated by the following:

... Most self-paced modules will be developed by repackaging available materials. This should result in very little change in material costs.

... Since the use of media is cheaper than the use of labor and since media will, many times, take the place of instructors in routine matters, a more efficient use of resources and professional labor should result.

> ... The decrease in drop-outs and the increase in student achievement (the research findings of other self-paced instructional systems) represent a definite increase in the productivity of the system.
>
> ... The use of proctors make it possible for one professor to handle up to 100 students in one course in the same time that he could handle 30 students in the conventional system.
>
> ... The highly measurable characteristics of individualized instruction make it possible at last to effectively measure teacher-effectiveness and to base a reward system upon documentation that is fair.

Individualized-instruction does represent an increase in teaching effectiveness and, hopefully, a decrease in cost that is manifested in the production of mediated course content, in the directed use of student effort, on the more valuable use of faculty time, and in the higher productivity of the college.

It is obvious (from well-documented research findings) that self-paced, individualized-instruction methods show a tremendous potential. They can be applied to meet the

needs of a wide range of abilities in students. They also promise to give the taxpayers a respite in paying out ever-increasing school costs. They can be used in producing more and better educated citizens who can assume a more effective social role.

The talented student, the disadvantaged student, the shut-in, and the "selected-out" student -- through this system -- are given an equal opportunity to avail themselves of the advantages of a post-secondary education.

And, finally, individualized instruction promises to provide the vehicle in which educators can bring to industry the specialized expertise industry needs.

BIBLIOGRAPHY

Bloom, Benjamin S. et al. *Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain.* New York: David McKay Company, Inc., 1974. 207 pp.

Karthwohl, David R., Benjamin S. Bloom, and Bertram B. Masia. *Taxonomy of Educational Objectives, the Classification of Educational Goals; Handbook II: Affective Domain.* New York: David McKay Company, Inc., 1973. 196 pp.

Harrow, Anita J. *A Taxonomy of the Psychomotor Domain.* New York: David McKay Company, Inc., 1972. 190 pp.

Banathy, Bela H. *Developing a Systems View of Education: The Systems-Model Approach.* Belmont, California: Lear Siegler, Inc./Fearon Publishers, 1973. 90 pp.

Banathy, Bela H. *Instructional Systems.* Belmont, California: Lear Siegler, Inc./Fearon Publishers, 1968. 106 pp.

Berchin, Arthur. *Toward Increased Efficiency in Community Junior College Courses: An Exploratory Study.* Los Angeles: League for Innovation in the Community College, 1972. 231 pp.

Born, David G. *Instructor Manual for Development of a Personalized Instruction Course.* Salt Lake City: University of Utah, Center to Improve Learning and Instruction, 1970. 148 pp.

Born, David G. *Proctor Manual: Initial Draft.* Salt Lake City: University of Utah, Center to Improve Learning and Instruction, 1970.

Diamond, Robert M., et. al. *Instructional Development for Individualized Learning in Higher Education.* Englewood Cliffs, New Jersey: Educational Technology Publications, 1975. 189 pp.

Dillman, Caroline M. and Harold F. Rahmlow. *Writing Instructional Objectives.* Belmont, California: Lear Siegler, Inc./Fearon Publishers, 1973. 135 pp.

Espick, James E. and Bill Williams. *Developing Programmed Instructional Materials: A Handbook for Program Writers.* Belmont, California: Lear Siegler, Inc./Fearon Publishers, 1967. 138 pp.

Flanagan, John C., William M. Shanner, and Robert F. Mager. *Behavioral Objectives: Science, Social Studies, Mathematics, Language Arts. A Guide to Individualized Learning: Primary, Intermediate, Secondary.* Palo Alto, California: Westinghouse Learning Press, 1971. (Set of four books)

Hendershot, Carl H. *Programmed Learning and Individually Paced Instruction: Bibliography.* Fifth Edition. Bay City, Michigan: Carl H. Hendershot, Ed. D., 1973.

Johnson, Stuart R. and Rita B. Johnson. *Developing Individualized Instructional Material: A self-Instructional Material in Itself.* Palo Alto, California: Westinghouse Learning Press, 1970. 190 pp.

Keller, Fred S., and J. Gilmour Sherman. *The Keller Plan Handbook: Essays on a Personalized System of Instruction.* Menlo Park, California: W. A. Benjamin, Inc., 1974. 99 pp.

Kemp, Jerrold E. *Instructional Design: A Plan for Unit and Course Development.* Belmont, California: Lear Siegler, Inc./Fearon Publishers, 1971 130 pp.

Mager, Robert F., and Peter Pipe. *Analyzing Performance Problems or 'You Really Oughta Wanna.'* Belmont, California: Lear Siegler, Inc./ Fearon Publishers, 1970. 111 pp.

Mager, Robert F. *Preparing Instructional Objectives.* Belmont: Lear Siegler, Inc./Fearon Publishers, 1962. 60 pp.

Mager, Robert F. *Developing Attitude Toward Learning.* Belmont: Lear Siegler, Inc./Fearon Publishers, 1968. 104 pp.

Mager, Robert F. and Kenneth M. Beach, Jr. *Developing Vocational Instruction.* Belmont: Lear Siegler, Inc./ Fearon Publishers, 1967. 83 pp.

Mager, Robert F. *Goal Analysis.* Belmont: Lear Siegler, Inc./Fearon Publishers, 1972. 136 pp.

Popham. W. James. *The Uses of Instructional Objectives: A Personal Perspective.* Belmont: Lear Siegler, Inc./ Fearon Publishers, 1973. 135 pp.

Popham, W. James. *Criterion-Referenced Instruction.* Belmont: Lear Siegler, Inc./Fearon Publishers, 1973. 110 pp.

Postlethwait, S. N., J. Novak, and H. T. Murray, Jr. *The Audio-Tutorial Approach to Learning Through Independent Study and Integrated Experiences.* Third Edition. Minneapolis, Minnesota: Burgess Publishing Company, 1972. 184 pp.

Ruskin, Robert S. *The Personalized System of Instruction: An Educational Alternative.* Washington, D.C.: The American Association for Higher Education, 1974. 44 pp.

Sheldon, M. Stephen, and Young Park. *A Directory of Self-Instructional Materials Used in Community Colleges.* Second Edition. Los Angeles: The UCLA Danforth Junior College Program, 1972. 274 pp.

Sherman, J. Gilmour. *Personalized System of Instruction: 41 Germinal Papers.* Menlo Park, California: W. A. Benjamin, Inc., 1974. 225 pp.

Three-M Company, Visual Products Division. *How to Design and Produce Individualized Instruction Programs.* Minnesota: Minnesota Mining and Manufacturing Company, 1972. 20 pp.

U.S. Department of Labor, Manpower Administration. *Task Analysis Inventories: A Method for Collecting Job Information.* Washington, D.C.: Superintendent of Documents, U.S. Government Printing Office, 1973. 201 pp.

Weisgerber, Robert A. *Trends, Issues, and Activities in Individualized Learning.* Palo Alto, California: American Institutes for Research, 1972. 35 pp.

Wilson, S.R. and D.T. Tosti, Ph. D. *Learning is Getting Easier.* San Rafael, California: Individual Learning Systems, Inc., 1974. 188 pp.